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Fruit Growers Association of Adams County, Pennsylvania

Proceedings
For The Year 1909

54/108

Fifth Annual Convention at Bendersville
Dec. Fifteenth, Sixteenth and Seventeenth

THE

Fruit Growers Association

# of Adams County

Pennsylvania

ORGANIZED DECEMBER 18, 1903

PROCEEDINGS

of the

FIFTH ANNUAL CONVENTION

held in

FRUIT GROWERS HALL, BENDERSVILLE, PA.

WEDNESDAY, THURSDAY AND FRIDAY

DEC. 15, 16, 17, 1909

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Treasurer,	Wm. S. Adams,	Aspers

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Chester J. Tyson,	Flora Dale
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Adams, Mrs. W. S.,	Aspers, Pa.
Asper, Chas. F.,	Aspers, Pa.
Anderson, Joseph W.,	Stewartstown, Pa.
Anderson, H. M.,	New Park, Pa.

Bream, Samuel,	Biglerville, Pa.
Bream, Dill,	Bendersville, Pa.
Bream, Wm. E.,	Biglerville, Pa.
Boyer, W. W.,	Arendtsville, Pa.
Black, Wm. H.,	Flora Dale, Pa.
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Bosler, Frank C.,	Carlisle, Pa.
Brough, Edward,	Biglerville, Pa.
Busey, Rev. B. P. S.,	Bendersville, Pa.
Bassett, Charles E.,	Fennville, Mich.
Batterman, D. F.,	Gettysburg, R. F. D. No. 5, Pa.
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Cocklin, Miss Alice,	Bowmansdale, Pa.
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Deardorf, Anthony,	Mummasburg, Pa.
Dull, Thomas,	Aspers, Pa.
Dunlap, James M.,	Walnut Bottom, Pa.
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Day, T. F.,	Aspers, Pa.
Dunlap, F. S.,	Newville, Pa.

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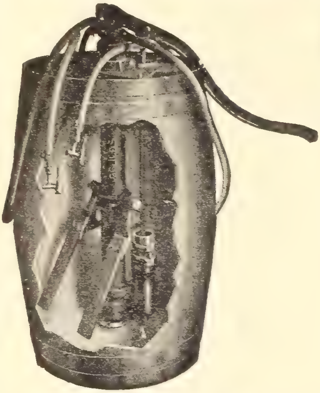

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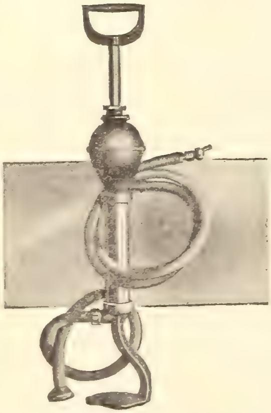

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The One Universally Valuable Double-Purpose Spray

Kills Insects
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Combines non-burning Arsenate of Lead with non-burning Bordeaux Mixture in a non-burning mixture that does the work thoroughly and brings handsome results at harvest.

Pyrox Doubled the Value of Apples

Mr. N. Bassett, Pawlet, Rutland Co., Vt., writes: "I have used Pyrox for two years with great success. I sent 100 barrels of my apples to New York commission merchants and they netted me $4 per barrel. One of my neighbors sent 10 barrels from his orchard in the same car. He received only $2 per barrel for his. This shows the difference between apples sprayed with Pyrox and those that were not taken care of, as he did not spray his trees."

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Mr. Joshua F. Crowell, West Yarmouth, Barnstable Co., Mass., writes: "I used Pyrox very successfully last season on apple and pear trees for fungous diseases and had a fine yield of good solid fruit, especially apples, which are in fine hard condition at the present time (February 12th) and keeping better than ever before. I also used Pyrox judiciously on strawberries, raspberries, grapes, plum trees, melons, squashes, cucumbers, beans and tomatoes, and also found it very effective on astors and nicotiana. In seasons before I have used it on elm and other shade trees with excellent results. I find it a safe, convenient and thorough insecticide and fungicide for fruit and for the family garden."

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Smith, J. H., ... Biglerville, Pa.
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Schlosser, Ira, ... Aspers, Pa.
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Shull, Robt. H., ... Tillie, Pa.
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Tyson, Wm. C., ... Guernsey, Pa.
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Tyson, Mrs. B. H., ... Aspers, Pa.
Tyson, Mrs. M. W., ... Flora Dale, Pa.
Tyson, Mrs. M. E., ... Guernsey, Pa.
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Taylor, Henry, ... Biglerville, Pa.
Trostle, Francis, ... York Springs, R. F. D., Pa.

Weidner, A. I., ... Arendtsville, Pa.
Wolfe, C. A., ... Aspers, Pa.
Weaver, Mrs. C. M., ... New Oxford, Pa.
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Wert, R. S., ... Biglerville, Pa.
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Weidner, Geo., ... Aspers, Pa.
Wolfe, Harry, ... Aspers, Pa.
Wible, R. E., ... Gettysburg, Pa.
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"Apple Grower"

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Guaranteed Minimum Analysis

Ammonia, -	2%
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Actual Potash,	10%

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Our Goods Are Recognized as

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CONSTITUTION

Preamble.

Being interested in fruit growing and believing that, by organization, we may materially advance our common interests, we hereby adopt the following Constitution and By-Laws:

Article I.—*Name.*

This Association shall be known as The Fruit Growers' Association of Adams County.

Article II.—*Object.*

The object of this Association shall be to encourage the co-operation of the fruit growers of Adams County for the protection and advancement of their common interests.

1st. By securing and disseminating such scientific and practical information as shall promote the general advancement of the fruit growing interests in this county, and shall tend to the improvement of the quality and quantity of our products.

2d. By securing such legislation as may be advantageous, and preventing that which may be detrimental.

3d. By securing such improved facilities in transportation as shall tend to give us more expeditious and economical distribution.

4th. By endeavoring to secure a better and more uniform system of packing and package.

5th. By devising some system of marketing our products which will open up and develop the markets and give to the grower a fair and remunerative return.

6th. And by endeavoring to obtain such improved systems of crop reporting as shall furnish, through co-operation with other similar Associations, accurate information concerning production; thereby enabling the fruit grower to know the exact situation.

Article III.—*Membership.*

1st. Candidates for membership may be elected by a majority vote of the members present, and upon the payment of $1.00 into the treasury shall be entitled to membership until the next Annual Meeting.

2d. Any member may renew his membership by the payment of annual dues, but upon failure to pay dues within three months after Annual Meeting, shall require re-election.

3d. No member shall receive the benefit of commissions or of co-operative buying by the Association, to an amount greater than $1.00 for the term of one year after election to membership.

Article IV.— *Dues.*

The annual dues of this Association shall be One Dollar ($1.00) payable to the treasurer at the meeting immediately preceding the annual meeting, for which the treasurer shall issue a receipt, this receipt to constitute a certificate of membership for the succeeding year.

Article V.—*Officers.*

Its officers shall consist of a President, one Vice President, a Recording Secretary, a Corresponding Secretary, a Treasurer, and an Executive Committee of five (5) members, consisting of the President, Recording Secretary and three others, all of whom shall be elected by ballot at each annual meeting for the term of one year or until their successors shall be chosen.

Article VI.—*Quorum.*

Five (5) members shall constitute a quorum for the transaction of business.

Article VII.—*Amendments.*

The Constitution and By-Laws of this Association may be amended at any regular meeting by a two-thirds vote of the members present, a notice of the proposed amendment having been presented in writing at a previous regular meeting.

GRASSELLI'S
SPRAYING PRODUCTS

FOR THE CONTROL OF

AND

(The Codling Moth) (The Potato Beetle)

USE
GRASSELLI'S ARSENATE OF LEAD--PASTE AND POWDERED

FOR FUNGOUS DISEASES
USE
GRASSELLI'S BORDEAUX MIXTURE--PASTE AND POWDERED

FOR THE CONTROL OF BOTH IN 1 OPERATION
USE
GRASSELLI'S BORDEAUX-LEAD ARSENATE MIXTURE--PASTE AND POWDERED

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Use Grasselli's Concentrated Lime-Sulphur Solution

(The San Jose Scale)

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BY-LAWS

ARTICLE I.—*Duties of President.*

The President shall preside at all meetings of the Association and have a general supervision of its affairs.

ARTICLE II.—*Duties of Vice President.*

The Vice President shall preside at any meeting in the absence of the President, and may act on the Executive Committee in case of the President's absence.

ARTICLE III.—*Duties of Recording Secretary.*

The Recording Secretary shall write the minutes of the meetings of the Association and have charge of its Records and Reports.

ARTICLE IV.—*Duties of Corresponding Secretary.*

The Corresponding Secretary shall conduct the correspondence of the Association and shall receive for so doing his necessary expenses for stationery, postage, etc. He shall also act as Recording Secretary in the absence of that officer.

ARTICLE V.—*Duties of Treasurer.*

The Treasurer shall receive and keep an accurate account of all moneys belonging to the Association, paying out same on an order of the Association, signed by the President. He shall make a report of all receipts and disbursements at the annual meeting or at any time at the request of the Association. He shall mail a notice of dues to all members one week prior to the November meeting, at which time all dues are payable, and shall issue certificates of membership in exchange for all dues received. He shall also keep a roll of members who have complied with Article IV. of the Constitution and embody same in his annual report.

ARTICLE VI.—*Duties of the Executive Committee.*

The Executive Committee shall have general supervision of the affairs of the Association, auditing all bills and accounts and carrying out the purposes of the Association. They shall also prepare a program for each meeting, same to be announced at the preceding meeting.

ARTICLE VII.—*Meetings.*

There shall be a regular meeting of the Association on the second Saturday of each month at 7:30 P. M., unless otherwise ordered. The meeting held in December to be regarded as the Annual Meeting. Special meetings may be convened by the Executive Committee at such time as they may appoint.

ARTICLE VIII.—*Initiation of Officers.*

All new officers shall assume the duties of office at the opening of the meeting immediately following the one at which they were elected. Except that the newly appointed Executive Committee shall prepare and announce at the January meeting the program for the February meeting.

ARTICLE IX.—*Order of Business.*

1st. Reading of minutes of previous meeting.
2d. Nominations and elections.
3d. Reports of committees.
4th. Deferred business.
5th. Communications.
6th. New business.
7th. Discussion of questions.

INTELLIGENT SPRAYING

The Rural New Yorker stated editorially, Sept. 19th 1908:—"The Rural Grounds now appear to be free from scale for the first time in 12 years. * * * It has been a long fight, excessively discouraging until the soluble oils came to the rescue three years ago. The prospect brightened at the first trial of these handy preparations, and repeated use seems to have resulted in victory." Spraying was omitted this year.

"SCALECIDE"

alone did more in three years than Lime-Sulphur and other "dopes" di in nine. Are you still in the Lime-Sulphur ranks?

Send for Booklet "Orchard Insurance."

If you want cheap oils, our "CARBOLEINE" at 30c. per gallon is the equal of **anything else.**

"I HAVE SO LITTLE FUNGUS

that I cannot afford to mark my fruit with Bordeaux," says Mr. Geo T. Powell of Ghent, N. Y., a grower of fancy apples. "I have less scale and finer foliage than ever before." REASON: Five years consecutive use of Scalecide.

PRICES:

50 gal. bbl. $25, 30 gal. tin $15, 10 gal. can $6, 5 gal. can $3.25, 1 gal. can $1. F. O. B. New York or Guernsey, Pa., cash with order. Freight paid on cash orders for 50 gals. and over to one address.

Three gallons added to water makes a barrel of spray.

"SULFOCIDE"

Soluble Sulphur Summer Spray.

A new Substitute for Bordeaux Mixture

Far surpassing it in effectiveness, durability and ease of application, at one-half the cost or less.

The most powerful, non-poisonous fungicide for plant life—for rust, mildew, scab, canker, brown rot, etc.

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EDWIN C. TYSON, Penna. Sales Agent

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FLORA DALE, PA.

PROCEEDINGS

OF THE

FIFTH ANNUAL CONVENTION

OF THE

FRUIT GROWERS ASSOCIATION

OF

ADAMS COUNTY, PA.

The Fifth Annual Convention of the Fruit Growers' Association of Adams County was called to order by Chester J. Tyson, acting chairman, at 2:00 p.m., Wednesday, December 15, 1909, in Fruit Growers' Hall, Bendersville, Pa.

The convention was opened with prayer by the Rev. B. P. S. Busey.

Mr. Tyson. I regret very much to announce that our President, Mr. Eldon, is prevented from attending the opening session by a very severe cold. We hope to have him with us later and his annual address will appear in our "Proceedings" just as if he were here.

PRESIDENT'S ADDRESS.

ROBERT M. ELDON.

The announcement of the Fruit Growers' Association of Adams County states that this is to be the fifth annual convention. If habits are fixed by the repetition of actions, I have a notion that we are acquiring the convention habit. However, we are not pioneers in this respect. The newspapers are full of the announcements of conventions of all kinds.

Before our ancestors became individually independent, and veritable ambidexterous jacks of all trades, they belonged to some corporation, following from father to son and grandson some definite occupation or trade. A man was born, lived and died a carpenter, a weaver, or a mason. And now after a period of strenuous activity as individuals, we are swinging back towards that former way. Not to follow our father's trade, but to follow one trade. We do not expect to lose the desire or right to choose what we shall do, but having chosen one thing, will probably merge ourselves as individuals into the mass of those who do that thing; will be willing to sacrifice part of our individual independence for the sake of the influence of the mass.

As individuals we recognize the fact that we are not sufficient of ourselves. That only in combination are we able to meet the demands made upon us in the business of growing fruit. No one man has time to investigate all its phases. No one man is able to investigate them all. The men who come here as instructors or lecturers are brought here because they have investigated but one part of the subject, and they are careful to say that many of their deductions have not been certainly established or proven.

In a discussion of the subject matter of what is now the Lafean Bill in Washington last winter, two of our members represented the Pennsylvania State Horticultural Society and the Fruit Growers' Association of Adams County. The discussion had not progressed very far when it became evident that very divergent views were held by the delegates from the different parts of the country represented at the conference. Generally speaking, the very Far West in one camp, and the East and the Middle West in the other.

The Far West satisfied with present conditions and insisting that if change were to be made, and packing and packages standardized and legalized, that the methods of packing the crop of the coast states, California, Oregon and Washington, were the best in existence, and that their packages should be adopted as standard. They want their present apple boxes standardized as bushel boxes, although they hold but 2,150 cubic inches, or the volume of the Winchester bushel. The Winchester bushel is our stricken measure and would not be accepted in the East as the measure of a bushel of produce, such as apples or potatoes or other vegetables. We couldn't sell our crops were they measured in that way, and were we the purchasers we wouldn't take that kind of measure.

The Winchester bushel measured level full is naturally the measure of small grain, which is now almost universally weighed, and which could not be conveniently handled if heaped in a measure. Why should the Winchester bushel be the standard measure for apples in boxes? Because it is the same in capacity as the Western apple-box, and the delegate from Washington says that our box suits us; we have been using it and we intend to keep on using it. In like manner, and in the same vein, while the conference was discussing the capacity for a barrel: "We don't care what is the capacity of a barrel, we do not use barrels for our fruit."

The Lafean Bill proposes to make the standard barrel for apples the same as the New York barrel, a package of certain stated dimensions and holding 7,026 cubic inches. As it is the practice in many sections to call a barrel of apples three bushels, it was finally decided in the convention, the delegate from Washington always and all the time dissenting, to recommend one-third of the capacity of the standard barrel as the capacity of the standard bushel box, namely, 2,342 cubic inches. This was distinctly in a spirit of compromise, as many of the delegates were in favor of a larger package, even as large as 2,550 cubic inches.

It seems to me that there would be gain rather than loss in making a bushel to hold as much as 2,550 cubic inches, a generous heaping of the measure makes a pleased customer whether he be the retailer or the consumer. Part of the price of our fruit is to be spent in advertising at any rate and it is better to give this part to the purchaser of our fruits than to invest it in the public prints, and it is better advertising, too.

An important section of the Lafean Bill requires that the name of the grower, his address, and the name of the packer shall be put on the package, and that if the box or barrel is repacked, the person who repacks the fruit shall substitute his name for that of the original packer. Thus, if contents of package are not as represented, the person responsible can be readily ascertained.

Poor packing is such short-sighted policy, that nothing in the way of legislation ought to be necessary to correct it; but there are in the fruit-growing business, as in every other business, persons who are natural cheats, and legislation is as necessary to suppress them as to protect the honest grower. The aim of this section is also to protect the buyer of closed packages, as it is impossible to open every package of fruit every time it changes ownership.

I think it is good practice to give a well-heaped measure, and I would not want to indorse any bill that has as one of its features the restriction of the size of the measure. Give good measure and good fruit and you have a satisfied customer; one who will come back. You cannot lose him if you wanted to. He will take time and trouble to find you. What is more, he will tell his friends of your good fruit, your well-filled package, good down to the bottom.

Mr. Lafean has been criticised as a man who knows nothing about apples. It was claimed that Mr. Porter knew nothing about the Porter Bill. Congress is not composed of experts in all subjects and we do not expect any member to know all about apples. Some representative body must legislate. We cannot wait for experts. I think the bill should receive our hearty support. No one thinks the present bill is perfect, but all legislation begins in imperfection. It must first be passed, then tried, and if necessary be remodeled. Finally it will be found to reach the end desired, and to accomplish the desired result.

One characteristic of the Association is the good fellowship existing among its members, and I believe that they try to extend it to the stranger. We try to make him one of us. Several times at least we have been able to have a man repeat his visit. I extend the welcome of the society to all who are with us or coming to later sessions. We expect to enjoy your presence. We have had a number of visitors and we have yet to hear the unfriendly or unkind word.

A pleasing incident of the apple harvest time was the visit to the Adams County orchards of a part of the Horticultural section of the School of Agriculture of the Pennsylvania State College. About twenty students accompanied by Professors Ralph L. Watts and W. J. Wright of the Department of Horticulture. This visit was good for us and I am as certainly sure that it was good for the young men. Professor Watts is a rattling good instructor and kept the wits of his boys constantly on the jump to observe the different phases of the fruit-growing business as they presented themselves.

They spent two days in the orchards and the included evening in the Hall at Bendersville. When leaving us at McKnightstown, all declared themselves as having had a good time from all points of view. I believe that those of our membership who made the trip were equally repaid. It was good advertising and our business needs that as much as does any other.

Our apple crop was the usual full year crop. Entire returns are not at hand, but what we have would indicate that the crop was somewhat heavier than that of 1907. Its quality was superior also to that of the 1907 crop. During May much apprehension was felt for the crop on account of the cold weather, and there is no doubt that there was a considerable injury to the blossoms. On the trip through the county at picking time many trees were observed that bore fruit only on the south and southeast sides, showing very conclusively that the opposite or stormward side had been injured, the fruit-bearing side having been saved by the protection which the branches and leaves afforded. The apples were very highly colored. The buyer of the bulk of the crop declared they were the handsomest east of the Mississippi. Many of the plantings which have been made since it was discovered that our county was good for apples are now approaching bearing age, so that the returns of the near future are expected to show a large increase of fruit.

Some of our growers report unexpected outbreaks of scale, which they attribute not so much to the agent used to kill the scale, as to the impossibility of doing a good spraying job in the windy spraying season. These reports come mostly from those who have done most of their spraying in the spring. Spraying for codling moth seemed to be more uniformly successful. Taking it as a whole I think we are making satisfactory progress in the use of spray materials. The remedies themselves seem to be too prominent in the list of orchard charges, but perhaps in the near future with the increasing demand that our growing orchards will create, some one may be induced to erect in our midst a plant for the manufacture of spray material.

We believe that this convention will be better than our former good ones. Our instructors have been selected with the usual care and we expect them to be as good as those of other years, plus the added year. I need not take the time to set out their good points. A glance at the program will be all that is necessary, to excite your attention and interest. After that the various instructors will speak for themselves.

Dessert follows the meat. After the serious business of the day we offer you a lighter character of pleasurable entertainment for the evenings. A combination of work and play that will leave you at the conclusion of these meetings in a state of satisfaction; at peace with yourselves and with us. Perhaps if you are not already a member you will have a firm determination to become one at the first opportunity. We expect to greatly increase our membership during this week, and opportunity to join us will be freely given. A pleasant thing about the membership of this Association is, that having once embraced its privileges and duties, members seldom quit. Membership is not expensive, and our meetings are as necessary to our members as is a clearing house to a chain of banks.

Mr. Tyson. In Mr. Eldon's place I desire to welcome all who have come to our convention, whether members or not, and to invite your active participation in the proceedings. I want you to feel free to ask questions and to enter into the discussions at any time during the meetings.

Three years ago, Dr. Hunt, then a new director of our Experiment Station at State College, requested this Association to appoint a delegation to meet with other delegates at the annual meeting of the State Horticultural Association at Harrisburg, to designate what line of work the fruit growing and horticultural interests in general would like to have carried out by the Experiment Station. At that conference it was suggested that the Station undertake experiments on Orchard Fertilization with respect to its effect on the yield and quality of the fruit. Prof. J. P. Stewart, of the Experiment Station, was at once put in charge of this work and has followed it continuously ever since. Prof. Stewart is with us and will address you on his results to date.

ORCHARD FERTILIZATION.[1]

PROF. J. P. STEWART, *Department of Experimental Horticulture, School of Agriculture, Pennsylvania State College, State College, Pa.*

The problem of successful orcharding is to secure and maintain a balanced treatment. Many factors are involved,—moisture, plant food, light, protection (from enemies, frost and disease), correct varieties and location, and correct business management. None can be neglected without danger of loss, and it is the weakest factor that limits the crop. The limiters, therefore, must be found and corrected. Money and energy spent on factors already relatively strong are likely to be wasted, while on the other hand, the weak factors will respond to care. Hence, the finding and lifting of limiting factors, coupled with the maintenance thereafter of a balanced orchard treatment, is the correct policy and the keynote to success.

You are already acquainted with the scope and general character of our experiments along this line. But I would recall the facts that we have under experiment in various parts of the state 91 acres of orchard, 49 of which (including 2,219 trees) are in partial or full bearing. The yields from these experimental orchards in 1908 were somewhat over 164,000 pounds of fruit, and in 1909, the third year, they were 256,000 pounds. The data for the tables and conclusions which follow, therefore, cover a period of three years and are derived from something over 420,000 pounds of fruit. The exact locations, soil types and varieties involved are shown in Table I.

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[1] Abstract of address given at meeting of Adams County Fruit Growers' Association, December 15, 1909.

TABLE I.

Location, Soil, and Other Data on Experiments Away from the College.

Expt. No.	*County*	*Owner of Orchard*	*Soil*	*Varieties*	*Age 1909*	*No. of Trees*
215	Adams	Tyson Bros.	Porter's Loam	York Imperial and Stayman Winesap	Yr. 10	160
216	Franklin	D. M. Wertz	Mont Alto Fine Sandy Loam*	York Imperial and Jonathan	10	160
220	Bedford	Mrs. S. B. Brown	DeKalb Stony Loam*	York Imperial and Baldwin	11 & 21	160
217	Franklin	J. H. Ledy	Mont Alto Loam*	York Imperial and Gano	16	358
218	Franklin	J. A. Nicodemus	Hagerstown Clay Loam*	York Imperial and Albemarle	10 & 14	400
219	Bedford	J. R. Sleek	DeKalb Shale Loam*	York Imp., Jonathan Ben Davis and Gano	7	320
221	Wyoming	F. H. Fassett	Fine Sandy Loam†	Northern Spy and Baldwin	37	115
336	Chester	A. D. Strode	Chester Loam	Grimes, Smokehouse and Stayman Winesap	7 - 9	120 105‡
337§	Mercer	St. Paul's Orphans' Home	Volusia Silt Loam*	Northern Spy, Baldwin and Rome	2	180&180
338	Lawrence	J. B. Johnston	Volusia Silt Loam*	Baldwin	21	80 & 105
339	Bradford	F. T. Mynard	Upshur Loam*	Baldwin and Fallawater	15	120 & 1

The first three experiments, 215, 216 and 220, comprise what we call our straight fertilizer experiments; the next four are experiments on cultural methods, with and without manures; and the last four are a combination of fertilizer and cultural methods experiments. Each of the fertilizer experiments contains sixteen plots of ten trees each. The treatments are shown in Table II. The symbols N. P and K refer to nitrogen, phosphates and potash; and they are applied at the rates of 50 lb. N., 100 lb. P_2O_5 and 150 lb. K_2O per acre in all cases. Plots 5 and 6 compare the muriate and sulphate as a carrier of potash. Plots 11 and 12 compare acid phosphate and "floats" as a carrier of phosphoric acid (phosphorus pentoxid, more correctly). The manure is applied at the rate of 12 tons per acre and the lime at 1,000 lb. per acre. All applications are made annually.

The combined results to date of the first three experiments are shown in Table II.

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*Soils un-mapped as yet, but probably closest to the types indicated according to the observations of C. F. Shaw and H. J. Wilder.

†This soil has received no series name but it is one that has been deposited in a lake bed formed by the temporary stoppage of the Susquehanna in cutting through the mountains.

‡In the two sets of figures in this and the following experiments, the first gives the number of trees under fertilizer treatment, the second those under differing cultural methods. In experiments 339, the latter includes only a sod mulch plot.

§Trees set out in connection with these experiments, hence, not yet in bearing.

TABLE II.

Influence of Fertilizers on Yield, Color and Growth.

Epts. 215, 216, 220.

Plot.	Treatment.	Yields 1908-9. Lb.	Per cent. Benefit.	Yields 1909 Third Yr. Lb.	Per cent. Benefit.	Per ct. of apples colored ½ or more.[1] 1908-9.	Per cent. Benefit.	Ave. increase per tree in trunk girth, in inches, 1907-9.	Per cent. Benefit.
1	Check	4643	....	1306	....	69.2	....	3.29	....
2	N P	6887	78.1	1770	51.2	47.9	—22.5	3.54	8.9
3	N K	5653	82.8	1409	36.4	57.	—14.5	3.63	19.1
4	Check	2313	....	897	....	72.7	....	3.18	....
5	P K	3577	62.5	1441	56.5	69.8	1.7	3.34	3.8
6	PK_2SO_4	2773	32.	1664	76.3	67.2	3.6	3.43	5.1
7	Check	1998	....	1067	....	59.	....	3.29	....
8	N P K	3847	67.4	1561	31.3	41.6	—20.3	3.97	18.2
9	N	4709	81.2	2675	104.2	43.8	—21.1	4.08	19.4
10	Check	2898	....	1431	....	67.8	....	3.48	....
11	Acid P.	2833	6.26	2126	52.2	69.3	3.3	3.49	—1.7
12	Raw P.	1548	—36.6	1073	—21.3	75.3	11.	3.29	—8.9
13	Check	2209	....	1327	....	62.5	....	3.68	....
14	Manure	4793	138.3	3423	178.5	56.0	— 9.1	4.30	21.6
15	Lime	1538	—21.7	895	—21.	66.7	— .9	3.73	9.6
16	Check	1843	....	1034	....	70.2	....	3.26	....

Striking things shown here are the strong beneficial effect of manure and of nitrogen on yield and growth, with an accompanying harmful influence on color. Plots 6 and 11 show surprising gains in the yields of the third year. Raw phosphate and lime continue to show deficits in every way except in color for the former and in growth for the latter. We can hardly see any reason for this harmful effect in the case of the "floats" and suspect that it is due to some temporary condition which will disappear later. The same may be true of the lime effect, though the reports of "Lime poisoning" made by Dr. Headdon in Colorado Bulletin 131 are worthy of consideration in this connection. It is also worthy of note that the plots which have made the best yield have also made the best growth, thus showing that reasonable amounts of yield and growth are not antagonistic but rather are associated.

A puzzling condition appears in the fact that wherever nitrogen has been applied in combination with other elements, the benefit decreases in a third year, while in plot 9 where it was applied alone the benefit in the third year increases distinctly. This is partly explainable in the larger yields of the former plots last year, thus bringing them more strongly under the operation of the biennial bearing habit.

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[1] In all these tables, the effects on color and size of the fruit were obtained from random samples, taken from the fruit of each tree as it was weighed, the aggregate sample from each plot amounting usually to one or two bushels.

Also the difference in yield between 8 and 9 may be traced directly to a deficit of at least 1,000 lb. that occurred this year in plot 8 of Experiment 220. This deficit was not due to the absence of apples on the trees. On the contrary an excessive number of fruits were started on this plot, despite its heavy crop of last year, and this very fact, coupled with the excessive foliage and extreme drought of the current season, almost prevented development in the apples. Plot 9 of course was subjected to similar conditions, but to a lessened degree in every way. Its original set of fruit and its foliage were less and its moisture situation is hardly as severe as that of plot 8. Thus, while some of the present results are undoubtedly entitled to the rank of "posers," yet they are not entirely beyond partial explanation at least; and at any rate they should not be permitted to cloud the main facts, which are given in the paragraph above.

In Table III we have another set of results from the fertilizer portions of Experiments 336, 338 and 339, which have been running for two years only. The applications are the same as in the experiments above.

TABLE III.

Influence of Fertilizers on Yield and Color.

Expts. 336, 338, 339. (a) Yields in Pounds, 1908-9.

	1 Check	2 N P	3 N K	4 Check	5 P K	6 N P K	7 Check	8 Manure	9 Lime	10 Check
1908, 1st yr.	562	860	748	1118	846	2178	1067	2338	3111	2748
Per cent. Benefit[1],		15.1	−19.8		−23.2	100.9		46.7	42.1	
1909 Totals,	1087	6435	6367	2502	3803	7212	2436	4600	2349	1720
Per cent. Benefit,		312.7	213.6		53.3	193.4		109.7	19.9	
1909.	(b) Color per cent. of apples colored ½ or more.									
Ave. per cent. Color,	57.2	40.–	39.8	49.4	46.5	38.0	49.7	49.0	50.3	54.8
Per cent. Benefit,		−14.6	−12.2		−3.	−11.6		−2.4	−2.8	

In Tables II and III we have had results from various combinations of fertilizer elements, as well as some from certain materials used singly. Those results being direct from the trees may be considered a close expression of the values thus far of the various combinations used. In many cases, however, we may wish to know which is the more active element in a given combination and approximately what values are to be assigned to each of the elements in it. For example, in plot 2 of Table II we find a benefit of 78.1 per cent. resulting from an application of nitrogen and phosphate.

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[1] The results of the first year were obviously unaffected by the fertilizer treatments, but they are included for the light they throw on some of the results of the second year, notably those in plots 2, 3 and 6.

Here the question arises as to how much of this effect was due to nitrogen and how much to phosphate. Any answer to this can be of course only an approximation of the truth and hence the values obtained and shown in the following table are not to be taken too literally. They are the nearest approach to the correct values, however, that we are able to obtain at this time and they were derived in the manner indicated in the footnote to the table.

TABLE IV.

Influence of Fertilizer Elements on Yield, Color and Growth.[1]

Estimated Per Cent. of Benefit.

Expts. 215, 216, 220.	YIELD.		COLOR.	GROWTH[2]
	1908-9.	1909	1908-9.	1907-9.
Nitrogen, In Combination, ...	49.2%	15.55%	—19.35%	12.1%
Nitrogen, Alone, ...	81.1	104.2	—21.1	19.4
Ave. Influence of Nitrogen, ..	65.2	59.9	—20.23	15.8—
Phosphate, In Combination, ...	28.9	35.65	— 3.13	— 3.2
Phosphate, Alone, ...	6.2	52.2	3.3	— 1.7
Potash, In Combination, ...	33.6	20.85	4.85	7.0
Manure, Alone, ...	138.3	178.5	—9.1	21.6
Lime, Alone, ...	—21.7	—21.	— .9	9.6

Expts. 336, 338, 339.	YIELD.	COLOR.
	1909 (2nd year).	1909.
Nitrogen, In Combination, ...	236.5%	—11.9%
Phosphate, In Combination, ...	76.2	— 2.7
Potash, In Combination, ...	— 22.9	— .3
Manure, Alone, ...	109.7	— 2.4
Lime, Alone, ...	19.9	— 2.8

These results, being derived from those in tables II and III, are naturally not materially different, as a whole, but the values of the individual elements stand out more sharply.

Nitrogen and stable manure show striking beneficial effects on both yield and growth and characteristically harmful effects on color. The effect of the manure is greatest in the third year of the first three experiments, while that of the nitrogen is astonishingly great in the second year of the three later experiments.

Phosphates are showing considerable value on yield, especially when used in combination with other materials. Their effect on color and growth is apparently undecided, as 3 per cent. variations from the normal are readily attributable to limitations in our methods of determining values. Potash, in combination, has shown fairly good effects on yield and growth in the first experiments, but has apparently proved rather distinctly harmful in the second three; and considering the results in all six experiments its value in improving color is very questionable.

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[1] The results here given are calculated or taken from Tables II and III. For example, the value of nitrogen in combination was obtained by following the formula $\frac{NP+NK-PK}{2}$. In other words, the per cents of benefit obtained in plots two and three were added, from this sum was deducted the per cent of benefit in plot 5, and the remainder, divided by 2, is considered to be the value of nitrogen in the combination. The other values in combination were obtained similarly.

[2] Per cent of increase in trunk girth.

Lime in the first three experiments shows a distinct deficit in yield, and no advantage in color, but apparently a fair increase in growth. In the other experiments an apparent benefit in yield is shown. This, however, is due to an unusual increase on the lime plot of experiment 339, an increase which was due probably more to a favorable moisture situation this year than to any effect of the lime. It is surely a significant fact that in five out of six places thus far, lime shows either no effect or a distinct deficit in yield.

It will be noted that practically none of the treatments have materially improved color while a number of them have distinctly decreased it. This reduction in color is undoubtedly associated with *delayed maturity* and a *diminished light supply to the fruit*, the latter being due to an increase in the density of foliage following the application of the fertilizers. The value of sunlight in developing redness in apples is scarcely appreciated. In a test conducted during the fall on York Imperial apples it was found that exposure to sunlight after picking increased redness by over 35 per cent, while apples confined in the dark, or exposed to electric light and under identical conditions otherwise, showed practically no increase in redness. *Maturity in sunlight* on the trees is undoubtedly the great influence affecting redness in fruit, and when soil ingredients apparently affect it, their effect is produced indirectly, through a modification in the main influence.

In table V, we have the financial value of fertilization as shown in some of our most striking results of this year.

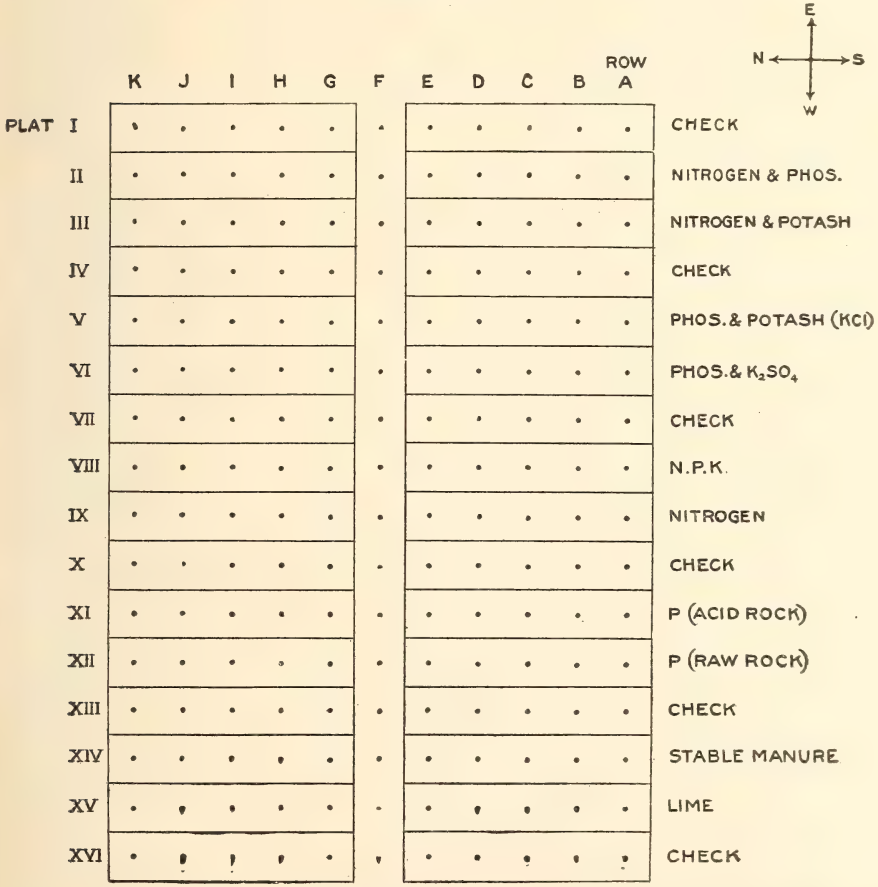
TABLE V.

Financial Value of Fertilization.

Expt. 221, 1909 (3rd Yr.)	Yield Lb.	Bushels per A.	Value at 50c.	Cost of Fertilizer	Net Gain per Acre.
Unfertilized, plots 4 and 7, ...	19448	194.5	$ 97.25	$	$......
Com. Fertilizer, plots 6 and 9, ...	47028	470.0	235.00	13.00	124.75
Manure, plots 5 and 8, ...	48550	485.5	242.75	15.00	130.50
Expt. 220, 1909, (3rd year).					
Unfertilized, plots, 13 and 16, ...	291	27.9	$ 13.95	$	$......
Manure, plot 14, ...	1947	373.8	186.90	15.00	157.95
Expt. 338, 1909, (2nd year).					
Unfertilized, plots 1 and 4, ...	2607	156.4	$ 78.20	$	$......
Com. Fertilizer, plots 2 and 3, ...	12026	721.5	360.75	15.00	267.55

It is to be noted that the net gains are obtained after deducting both the cost of the fertilizer and the value of the unfertilized crop, also the fruit here is valued at 50 cents per bushel, while the actual prices obtained for it varied from 50 cents to $1.25 per bushel; and any increase in the appraisement of the fruit of course will proportionately increase the net gain. It is also to be noted that variations in the factors of tillage, spraying and pruning produced no material effect on the size of the crop, since the treatment of all plots in these respects was uniform.

Figure 1.



Such striking results as these of course are not to be expected everywhere. They evidently occurred here because plant food was the crop limiter in these orchards. For any given case this can only be determined by experiment. These orchards are on three diverse soil types. The soil in one case was evidently "run down"; in another case it was in average condition; and in the third the soil condition was apparently above the average. These orchards are from 21 to 37 years of age, and they are the only ones under experiment above 20 years old. Age, however, is not a sure index of the need of plant food, as one of our youngest orchards, a seven-year old, is responding strongly to fertilization, while some older ones have proved unresponsive. The big fact is that when such results as these are obtainable anywhere, it raises a strong suspicion that similar benefits may be obtained in many other orchards. And these results show beyond peradventure that in some orchards apple trees, like other plants, respond strongly and directly to applications of plant food.

Experiments on Cultural Methods.

Closely associated with the question of plant-food, is that of soil moisture. It is the available moisture that determines in a large measure whether or not apples shall attain their proper size; and it is largely to modify moisture supply that the various cultural methods are followed. The plan of our experiments comparing these methods is shown in Figure I.

Plan of Experiment on Cultural Methods and Manures.

As shown in the figure, this experiment tests four methods of soil management, viz.: clean tillage, tillage and cover crop, sod mulch, and sod. Each treatment occurs both without fertilization and with it. The stable manure is applied annually at the rate of 12 tons per acre; and the commercial fertilizer at the rate of 30 lb. of nitrogen (NO), 60 lb. phosphorus pentoxid (P_2O_5), and 100 lb. of potash (K_2O).

On the mulch plot all herbage remains in the orchard, the first cutting being raked to the trees as a mulch, and an additional mulch of old straw, swamp hay or buckwheat straw at the rate of about three tons per acre is applied annually. In this latter respect it differs from the so-called "Hitchings plan," and as a conserver of moisture it is undoubtedly very much better than that plan. On the sod plot, the first cutting of herbage is removed from the orchard and the second is left where it falls. The tillage plots are all cultivated until early in July, when those receiving the cover crop are seeded to crimson clover, hairy vetch or medium red clover and alsike, either singly or in combination. The results to date are from the unfertilized plots of the young orchards, and are shown in Table V. These results and those in later tables on young orchards have been obtained by combining the results from three orchards, whose age as noted in Table I ranges from seven to sixteen years.

TABLE VI.

Effect of Cultural Methods on Yield, Color, Size and Growth, Without Fertilization.

Expts. 217, 218 and 219. Young orchards. (a) Yield.

1907-9.	I. Clean Tillage.	IV. Tillage and Cover Crop.	VII. Sod Mulch.	X. Sod.
Totals, 3 years, ...	15048 ℔	16057 ℔	17776 ℔	13880 ℔
Ratios, ...	108.4	115.7	128.1	100.
	100.	106.7	118.1	
		100.	110.7	

1909 (b) Color. Per cent. Apples colored ½ or more.

Avrage per cent.,	75.4	81.	81.5	85.6
Ratios,	100.	107.4	108.1	113.5

1908-9. (c) Size. Average weight of Apples.

Average weight,	4.5 oz	4.74 oz	4.91 oz	4.69 oz
Ratios,	100.	105.3 100.	109. 103.6	104.2

1907-9. (d) Growth. Increase in Trunk-girth.

Average increase,	4.38 in	4.14 in	4.29 in	3.58 in
Ratios,	122.3	115.6 100.	119.8 103.6	100.

In these results, the mulch system is first in yield and size of apples, second to sod on color, and second to clean tillage by a slight margin on growth.[1] It has surpassed the cover crop method on every phase and in total ranking is plainly first thus far in the combined results of this group of experiments. Reserving judgment on the relative merits of these systems for the present we will turn to consider the data from a similar experiment in an older orchard,—that of Mr. Fassett, in which the trees are now 37 years old. The results from the unfertilized plots in this orchard are shown in Table VII.

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[1] The margin is really slighter than appears in the table, as the 1909 measurements in the mulch plot of experiment 218 were taken a little higher on the trunks than those of 1907, owing to the presence of screens on the trees at the later date.

TABLE VII.

Effect of Cultural Methods on Yield, Color, Size and Growth Without Fertilization.

Expt. 221, Mature Orchard. (a) Yield.

1907-9.	IV. Tillage and Cover Crop.	VII. Sod Mulch.
Totals, 3 years,	34269 ℔	23294 ℔
Ratios,	147.1	100.

1908-9 (b) Color. Per cent. Apples colored ½ or more.

Ave. per cent. of color,	57.4 %	87.5 %
Ratios,	100.	152.4

1908-9 (c) Size, average weight of apples.

Average weight,	4.75 oz	5.04 oz
Ratios,	100.	106.1

1907-9 (d) Growth, Increase in Trunk-girth.

Average increase,	2.9 in	1.32 in
Ratios,	219.7	100.

From the above results it will be noted that, in the mature orchard, tillage with a cover crop for three years has been far superior to sod mulch in yield and growth, having borne nearly one and a half times as much fruit and showing more than double the increase in growth. In color, the mulched fruit excels by more than 30 per cent.,[1] and in average size of apples it excels by about 6 per cent. This last fact is undoubtedly connected with the smaller crop on the mulched trees.

The results of Tables VI and VII are apparently contradictory. They are all explainable, however, on the bases of soil moisture and age of trees. In the young orchards, with the herbage and three-ton addition of straw, an effective mulch of sufficient extent was maintained, while in the old orchard we were unable thus to cover more than probably half the root area. In the latter case the term *sod* mulch was distinctly appropriate since at least the outer half of the roots was under a typical sod and often in dust-dry condition.

The results in Table VI indicate that, even in trying seasons, such as the last two have been, the moisture in orchard soils may be conserved more effectively by a good mulch than by tillage. This conclusion is corroborated by moisture determinations made by Shutt, of Ottawa, Canada, in 1905 and 1906.[2] He also has found that leguminous plants, particularly those of dense and matted growth like hairy vetch, are much less severe in their drain on soil moisture than the grasses; and that the shade of the growing vetch is a better moisture conserver than the mulch formed by cutting and leaving it in place. In other words, the loss by capillarity and surface evaporation from the practically bare ground was greater, under the conditions at Ottawa, than the transpiration through the legume.[3]

The cover on our mature orchard is grass only, while on the young orchards a scattering growth of alsike or medium red clover has been maintained in addition.

In further explanation of the difference in effectiveness of the mulch and cover-crop methods in Tables VI and VII, we may call attention to the hastening influence on bearing, which sod undoubtedly exerts under favorable conditions. This was shown in our results of last year,[4] where sod on these same three orchards surpassed clean tillage in yield by 13 per cent. It is also shown here later, especially in the sod-manure plot of Table IX. But the fact that this sod influence can be easily overdone and made to disappear under unfavorable conditions, is clearly shown in our results from the unfertilized sod plots of Table VI.

The next table is introduced to show the effect of adding fertilizers to the four cultural methods. All unfertilized plots are excluded from this table, and the yields given include both the manured and commercially fertilized plots under each method.

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[1] Really the mulch excels in color by 52.4 per cent, using the amount of color on the cover crop area as a base.

[2] Central Experimental Farm. Report of the Chemist, p. 151, 1906.

[3] Ibid, 1904, p. 158.

[4] Pa. Bul. 91: 15. 1909.

TABLE VIII.

Influence of Cultural Method on Yield, With Fertilization.

Expts. 217, 218, 219. Young Orchards.

	2 & 3. Clean Tillage	5 & 6. Tillage and Cover Crop.	8 & 9. Sod Mulch.	11 & 12. Sod.
1908 Yields, ...	9193 ℔	9512 ℔	11203 ℔	10351 ℔
1909 Yields, ...	14554	12443	12571	12823
Totals, ...	23747	21955	23774	23174
Ratios, ...	108.2	100.	108.3	105.6
Expt. 221, Mature Orchard.				
1908 Yields, ...		6684	10351	
1909 Yields, ...		28297	22545	
Totals, ...		34981	32896	
Rations, ...		106.3	100.	

As compared with Tables VI and VII, these results show a marked leveling effect from addition of fertilizers. In other words, the applications of plant food have tended strongly to reduce or even nullify the differences due to cultural methods. This effect was also very distinct in the appearance of the trees in the field.

A consecutive increase in productiveness following the addition of plant food has been very marked in some cases. For example, the mulched plots of Experiment 221, receiving manure and commercial fertilizer, in 1907 produced 3,050 pounds of fruit; in 1908, as seen in the table, they produced 10,351 pounds; and in 1909, 22,545 pounds. And this occurred on plots receiving no tillage.

Fertilization for Different Cultural Methods.

The question often arises as to what is the best form of fertilizer to accompany different cultural methods. This question is partially answered by the data in Table IX.

TABLE IX.

Effect of Manures on Yield.

Expts. 217, 218, 219.

Season 1908-9 (2nd & 3rd Yr.)	Unfertilized.	Stable Manure 12 T. per Acre.	Com. Fertilizer, 30-60-100 Lb. per Acre.
Clean tillage, ...	13698 ℔	21605 ℔	23022 ℔
Tillage and Cover Crop, ...	14550	20582	20681
Sod Mulch, ...	15702	23678	20408
Sod, ...	11706	24772	17929
Totals, ...	55656	90637	82040
Ratios, ...	100	162.8	147.4
		110.5	100.
Expt. 221.			
Tillage and Cover Crop, ...	33119	31924	35502
Sod Mulch, ...	21091	35396	28370
Totals, ...	54210	67320	63872
Ratios, ...	100.	124.3	117.8
		105.4	100.

This table shows the influence of manures[1] on yield when used in connection with different cultural methods. It will be observed that in every case except one, the yields from the fertilized plots have surpassed those from the unfertilized. And in the one exception the yields on the corresponding fertilized plots this past year were more than double the yield on it. In total effect, considering all treatments, the fertilized plots show a nice per cent of increase over the unfertilized; and the stable manure at the rates applied shows a small gain over the commercial.[2]

Examining the data still more closely, we see that in every case on the tilled plots commercial fertilizer has surpassed the manure, while on the untilled plots the reverse is true. In other words, the present data indicates that, from equal values of manure and a proper commercial fertilizer the best results are obtained by using the manure on sod or mulch areas, and reserving the fertilizer for use in connection with tillage. Either material, however, may be used satisfactorily and it is very probable that in any case a more or less regular alternation can be made more successful than any thing else.

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[1] The complete commercial fertilizer is here included under the term "manure."

[2] Twelve tons of average stable manure are estimated to contain about 120 pounds each of nitrogen and potash (K_2O), and about 80 pounds of phosphorus pentoid (P_2O_5). The relative cost per acre, as applied, is about $15 for the manure and $13 for the commercial fertilizer.

TABLE X.

Effect of Manures on Color, Size and Growth.

A. Expts. 217, 218 and 219. (a) Color. Per cent. Apples colored ½ or more.

	Unfertilized.	Stable Manure.	Com. Fertilizer.
Average per cent.,	71.2	61.9	62.4
Per cent. benefit,		—9.3	—8.8
(b) Size. Average weight of apples.			
Average weight, ounces,	4.71	4.99	5.25
Ratios,	100.	106. 100.	111.5 105.2
(c) Growth. Increase in Trunk-girth.			
Average Increase, inches,	4.12	4.3	4.43
Ratios,	100.	104.1 100.	107.5 103.
B. Expt. 221. 1908-9. (a) Color. Per cent. Apples colored ½ or more.			
Average, Per cent.,	72.5	68.1	73.5
Per cent. Benefit,		—4.4	1.
(b) Size. Average weight of apples.			
Average weight, ounces,	4.89	5.42	5.33
Ratios,	100.	110.8	109.
(c) Growth. Average Increase in Trunk-girth.			
Average increase, inches,	4.22	5.86	4.92
Ratios,	100.	139 119.1	116.6 100.

Table X shows the effect of manures in both young and old orchards on color and size of fruit and on growth of trees. The effects have been fairly distinct in all cases,—reducing the color with one exception, and apparently increasing size of fruit and tree-growth.[1] In all cases, the color is least on the plots receiving stable manure. In the old orchard, manure shows some advantage over commercial fertilizer in wood growth and in size of apples, with effects reversed in the young orchards. The greater effect of commercial fertilizer in the young orchards is probably connected with the smaller area over which it is distributed, thus giving relatively stronger applications.

The above data are obtained from extensive work through a short period. In Table XI, we have data from the reverse conditions,—one experiment continued over 21 years.

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[1] We say "apparently" increased the size of fruit, since the matter of size is undoubtedly primarily dependent on soil moisture and number of fruits on the tree. Thus any fertilizer effect must necessarily be indirect, as in the case of color.

TABLE XI.

Massachusetts Experiment on Apples, 1889-1910.[1]

Treatments and Total Yields per A., to Date.

Plot.	1	2	3	4	5
Annual Treatment.	Manure, 10 Tons.	Wood Ashes, 1 Ton.	Check.	Bone & K Cl 600 & 200	Bone & Low G. Sulfate, 600 & 400.
Average Girth, Ratios, - - -	38.25 in. 136.7	33.23 in. 118.8	27.98 in. 100	32.27 in. 115.3	37.02 in. 132.3
Yields, lb., - - Ratios, - - -	24934 632.8	12841 325.9	3940 100	14453 366.8	21863 554.9
Color and Size.	4	1	5	3	2

These results are similar to those recorded in the preceding tables with the differences in some cases even more distinct. In every respect the treated plots have proved superior to the untreated. Manure leads in yield and growth but falls next to the check in quality. It is closely followed in yield and growth and much surpassed in quality by plot 5, which received ground bone and low grade sulphate of potash. The superiority of 5 over 4, which differs only in the carrier of the potash is very interesting. Whether it is due to the magnesia in the sulphate or to a harmful effect of the chlorine accumulating from the muriate, or to a soil difference, cannot yet be stated. It will be recalled that our results of the third year corroborate it, in plots which compare only sulphate and muriate.

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[1] Data furnished by Dir. Wm. P. Brooks, of the Mass. Expt. Sta., December, 1909.

The practical point, however, is that with such differences as these existing, even though unexplained, the safer policy is to apply potash in the sulphate form. The difference in cost is small, and if so desired it can be readily met by a reduction in the amount of potash applied. This would be justified by our present results, which indicate that the usual recommendations of this material for orchard use may be reduced to advantage.

Summary and Practical Suggestions.

From a general view of the results as a whole, we see that there is more than one way of securing good results in orcharding. In other words, there is more than one way of varying the limiters after they are found. For example, we can conserve moisture either with tillage or mulch, or we may secure apparently the same net results by proper fertilization. This gives opportunity for choice and permits the grower within certain bounds to determine his course on the bases of relative expense and practicability.

In most cases and especially in bearing orchards, this choice will result in tillage, either every year or one year in every two or three. The tillage will be supplemented by leguminous or other proper crops, and will receive additions of plant food when needed. But the relative cost of labor, mulching material, and manures, varies with the locality. And where labor is scarce or costly, or the land too sloping or stony for tillage, the grower need not lose heart. But with a good mulch properly supplemented with plant food, he may grow apples equal to the best,—apples in many cases more satisfactory than those of the man who depends entirely on tillage.

When we come to the application of fertilizers, the best test for their need is in actual trial or experiment. The appearance of the trees after all other factors are apparently right, may afford some evidence, as may also soil analyses. But the only sure evidence comes from careful trials, remembering that fertilizers can have little if any effect on the current year's crop.

Pending actual results, if it is desired to use fertilizer, our present general advice is to apply one carrying about 30 lb. nitrogen, 60 lb. phosphorus pentoxid (P_2O_5), and about 50 lb. potash (K_2O) per acre.[1] This should be accompanied by green cover crops or alternated with stable manure, ten tons per acre, at least once in three or four years.

The time of application is important. For soluble and transient materials like nitrate of soda, the best time is when the need is greatest, which is probably immediately after the supply of stored food is exhausted, or some time after petal-fall and before the first of July. The other more permanent material may be applied at the same time, or like stable manure they may be applied in early spring or in late winter.

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[1] Such amounts could be obtained by mixing either of the following combinations of high grade materials. (A) 100 pounds each of nitrate of soda, dried blood, and sulphate or muriate of potash (former safer); and 250 lbs. steamed bone meal. (B) 100 pounds each of nitrate of soda and sulphate or muriate of potash; 120 pounds dried blood, and 400 pounds acid phosphate.

For either temporary or permanent covers, leguminous plants are best both because of their nitrogen product and their lessened drain on soil moisture, especially the matted and dense growing kinds, such as hairy vetch.

Q. What kind of lime did you use in your experiments?

A. I used the ordinary agricultural lime—plain lime, fine, but not necessarily ground, sometimes air-slaked—anything to make it fine.

Q. In what form was the Nitrogen that you used?

A. It was in the form of Nitrate of Soda and Dried Blood—half Nitrate of Soda and half Dried Blood.

Q. Why is it applied in that form?

A. It is put on in that way in order to prolong the action. I can secure the same results by applying Nitrate of Soda twice—half soon after petals fall, and half later. I think Dried Blood is a very desirable carrier for Nitrogen as a tree fertilizer, though there is no objection to obtaining it in other ways.

Q. Is the fertilizer that applies 30 pounds of Nitrogen, 60 pounds of phosphoric acid, and 100 pounds of potash to the acre, a perfect fertilizer?

A. Yes; if by that you mean a complete fertilizer. If I were recommending a fertilizer for apples, however, I should prefer now to make it 30—60—50.

Q. Are those actual amounts?

A. Yes; they are the amounts of actual Nitrogen, Phosphoric Acid and Potash to be applied per acre.

Q. Is Muriate just as good as Sulphate?

A. I do not know whether it is or not. I am using Muriate in my 30—60—100; but right now I think the safest thing you can do would be to use Sulphate. It costs a little more; but present results seem to me to justify it. I do not know how they will look seven or eight years from now.

Q. In view of its action in other tests, would you not be afraid of its making the ground acid?

A. The Sulphate is not so likely to do this as the Muriate. In some cases, especially in the case of tobacco, Muriate cannot be used at all. Also in certain tests on small fruits, if I recall correctly, the sulphate proved best. A similar condition may be found to hold in the case of apples. Our third year results point that way rather distinctly.

Q. It looks to you then, as if the sod mulch is about the best?

A. It certainly does on the growing orchards. Clean tillage has it beaten just a little on growth; but when it comes to yield, color and size of the fruit, the mulch is thus far evidently preferable on the young trees.

Q. Do I understand you that you attribute this difference to the amount of moisture?

A. Yes.

Q. You said that there were two years of severe drought. Would not years when you had plenty of moisture, plenty of rain, change the conditions somewhat; might you not have to alter your figures somewhat in that case?

A. Not these figures, though of course, our future results may be different. I cannot predict what is going to happen in the future; but you know most people tell you that the main reason for tillage is to conserve moisture. The mulch in the most trying season, has conserved moisture better than tillage; and when I say mulch did it, I mean a real mulch, not an imitation of one.

Q. How many tons of straw did it require to cover an acre?

A. Three tons to the acre annually is the amount we are using.

Q. How old are those trees?

A. Seven to sixteen years of age—one orchard seven, one twelve to fifteen, one sixteen. The age of the trees is to be considered, as well as the amount of mulch and its extent from the trees.

Prof. Stewart. Notice here, that even on the mature orchard, where the mulch did not completely cover the roots of the trees, we have the size of the apples averaging a little greater than on the tilled portions. Can you explain this?

C. J. Tyson. How about the relative yield of fruit?

Prof. Stewart. Yes, that's it. The much larger crop on the tilled part kept down the size of the individual fruits.

Q. What effect has sod mulch on the bearing of fruit?

A. It seems to hasten the bearing habit.

Q. How do you know how to strike a limiter?

A. It demands experiment—actual trial. There is no other way that I know to do it. If you have to hire a man and pay him double wages for the time required to carefully experiment in one corner of your orchard, you will profit by it in the long run. You have to ask the trees themselves. The limiter is different in different places. No question about it, it must be found and corrected to get the best results.

Q. Will any fertilizer reach the growing crop?

A. No; you may be able to affect the crop of the following year. Nothing will reach the growing crop.

Q. Nitrogen will, won't it?

A. Of course it will affect the foliage, but not the amount of fruit.

ESSENTIAL ELEMENTS OF SUCCESS IN FRUIT GROWING.

Mr. Albert T. Repp, *President New Jersey State Horticultural Society, Glassboro, N. J.*

Mr. President, Ladies and Gentlemen, and Members of the Adams County Horticultural Society: I see that I am on the program for "Essential Elements of Success in Fruit Growing." One of our successes in New Jersey is the fighting of insects of the apple. In a practical way, we may talk on different methods used in different sections. When I attended a meeting last winter I visited a fruit farm where I saw the fruit grower trimming his trees in a way which looked very much to me as if he was ruining his orchard by his hard trimming. Some time ago I received a letter from him stating that he had received as high as six dollars per tree from a four year old orchard. So I think we have to be a little conservative about judging methods from other sections. But insects are the same in one section as in another—you have the same scale, same codling moth, same curculio and lice as we do, and the same methods will kill them. I am aware of the fact that Pennsylvania is a lime and sulphur state, and I feel a little timid about mentioning the material that we use for killing scale, which is crude oil. We start to spray about the middle of February with oil, after heating it to about one hundred degrees with live steam, agitated as it is used, so as to keep the heavier oils and light oils together, using as high a pressure as we can get, and after spraying for the scale, we begin to spray for lice. We will go over the trees with a light spray of oil when the leaves are as small as a mouse's ear, or smaller; the next thing that we spray for is the codling moth and the curculio, following immediately after spraying for the lice. We used four pounds of arsenate of lead to fifty gallons of water. This year we will use five pounds. Except where we had scab on our Wine Sap last year, we will omit the arsenate of lead and use instead one-half pound of paris green, three pounds of sulphate of copper with ten pounds of lime to fifty gallons of water. The reason we do not use the arsenate of lead in the Bordeaux mixture is because we use an excess of lime, which would make it too pasty to spray with. After the blossoms drop we use the Bordeaux, and immediately after the Bordeaux we use the lead. We used to count how many times we were going to spray the trees. We can now spray as many times as we please, until all danger of the codling moth and fungus is past. After the first spraying of the Bordeaux we put in two and a half pounds of sulphate of copper instead of three pounds to fifty gallons of water.

We use other methods of catching and destroying the coddling moth by scraping the bark of the older trees before we spray with oil. About July 1st we begin to put old burlap around the trunk of trees, and as soon as we see the sign of the worm coming out of the apple, we remove the burlap, destroy the worm and place the burlap back and repeat this about every ten days, until they stop coming from the apple. With all our spraying we find as high as fifty worms to a tree.

I have brought one of these bands to show you how it works (Shows burlap band with codling moth cocoons attached). We place one of these bands around the butt of the tree. We used one last year, and are going to use two next year—one at the bottom of the tree and one at the beginning of the limbs.

Q. At what season of the year do you apply these?

A. About the first of July—just as you see them coming out. Each moth lays about 200 eggs for the next year. These bands are put on after spraying, and are changed frequently. This one was taken off day before yesterday.

There are three brothers of us in the John Repp Estate. I have charge of four hundred and fifty acres all set in fruit that consists of Pears, Apples and Grapes, with 14,500 Wine Sap alone,—seven thousand just coming into bearing. Charles F. Repp has charge of the Cold Storage and Ice Plant, with a capacity for storing 10,000 barrels of fruit, and a capacity for making thirty-five tons of ice per day. Joseph P. Repp, who is in the commission business at No. 154 Dock Street, Philadelphia, Pa., has charge of selling all of the fruit from the farm. I thank you for your kind attention.

The Chairman. You are invited to ask Mr. Repp any questions desired.

Member. What fertilizer do you use, and when applied?

Mr. Repp. In the spring of the year we put on two or three handfuls to the tree—2½ per cent ammonia from fish and blood; 8 per cent phosphoric acid from rock; 10 per cent potash from muriate. We have been using muriate for 15 or 20 years. We plow that down and keep our orchards clear until the first of July; and then let the weeds go. We use 100 tons of basic slag (used 40 last year) and we get good results. If you want to give the fruit a better color, you can put the color in with a chemical of your own make, or some other. I use lime stone dust. I used 250 tons last year (about one ton to the acre).

Member. Is that ground lime stone?

Mr. Repp. Yes.

Member. Do you see any difference from the use of the lime stone?

Mr. Repp. Yes; it runs right to the roots. We get color and size, and crops, too.

Member. How much slag to the acre?

Mr. Repp. Six hundred (600) pounds.

Member. When ought it to be put on?

Mr. Repp. It ought to be put on now; but I cannot get it until March.

Member. How do you prune your apples?

Mr. Repp. The apples we set out from the nursery, cutting off a few bottom limbs. We thin at four or five years.

Member. I mean on your bearing orchards.

Mr. Repp. My father, years ago, used to trim very heavily. We are trimming less and less every year.

Member. What makes color but sunlight? How about giving the trees sunlight instead of chemical?

Mr. Repp. You get a crop with my methods—lower limb lying on the ground—and that is somewhat of an item, is it not, when apples are bringing a good price?

Member. What variety of Pears do you grow?

Mr. Repp. We grow Bartletts, Sickle and Kieffers; but Pears will not produce enough to the tree. They do not grow wide enough.

Member. How far apart do you set your trees?

Mr. Repp. About twenty feet apart.

Member. Is this Wine Sap, that you showed us, an early bearer?

Mr. Repp. Bears in about five or six years.

Member. What varieties of apples do you grow?

Mr. Repp. Wine Sap, Maiden Blush, Star, Early Ripe, Ben Davis—most of them; York Imperials won't bear at all.

Member. How old are your Wine Saps when they bear?

Mr. Repp. Four years.

Member. Do you attribute your color largely to the lime stone dust?

Mr. Repp. I can see where I put it—the color has never been better than this year.

Member. Do you think that brings the color on?

Mr. Repp. It brings the size. It is hard work to tell as to color. I thought so; and the man that worked for me did also.

Member. What does it cost per ton?

Mr. Repp. We get it delivered for $3.50 per ton.

Member. What is the actual fertilizer application per acre?

Mr. Repp. Two or three handfuls per tree the first year, and keep it up. Old trees as high as a ton an acre.

Member. What time do you apply?

Mr. Repp. In the spring of the year.

Member. Is ground lime better than air-slaked lime?

Mr. Repp. It lasts longer. Air-slaked is quicker, but it is gone sooner; the ground lime will act for years until it is used up.

Member. Is this Wine Sap that you have here anything like the Stayman Wine Sap?

Mr. Repp. Nothing like it.

Member. It is not so large?

Mr. Repp. No, it is not so large as the Stayman, but we get the quantity.

Member. What tools do you use for your orchard cultivation?

Mr. Repp. Bateman's Riding Cultivator.

Member. Can you give us any figures as to cost of erecting a cold sorage of say, 10,000 barrels capacity, and operating cost of same per diem?

Mr. Repp. Impossible for me to answer this question correctly, but about $20,000.

Member. Do you grade fruit before or after storage?

Mr. Repp. After storage.

Member. What have you found the best picking basket?

Mr. Repp. We use a bag.

Member. What is the best package for apples while in storage?

Mr. Repp. Hampers.

Member. What ladder, if any, do you use?

Mr. Repp. Tilley's Orchard Ladder.

Member. You doubtless have a regular rule of proceedure in picking and transferring apples to storage. Will you kindly describe it?

Mr. Repp. Apples picked and placed on sorting table and then placed in hampers and then loaded on a platform wagon made especially that hold 74 hampers. We do not have any bruised fruit. All culls are thrown out by the sorters at the tables.

Member. What sprayer do you use?

Mr. Repp. Demming Gasoline Sprayer.

The Chairman. As a committee to look over our fruit and report at a later session, I will appoint Mr. Bassett, Mr. Repp and Mr. Anderson. We do not offer any premiums; but we shall be very glad to have you look over the exhibit, and make any suggestions that you think may be to our benefit.

"GETTING TOGETHER."

C. E. Bassett, *Fennville, Mich., President Fennville Fruit Shippers' Association.*

In the words of the old colored preacher, "Before I begin my talk I want to say something." I do not presume to come to you with an idea that I can present any new or startling facts. I have frequently noted that the value of gatherings of this kind lies not so much in the new ideas received as in the inspiration or enthusiasm, which results from an exchange of experiences. To any wide awake man the spirit of enthusiasm is contagious and, noting the successes of a friend or rival, is sufficient to arouse in him the determination to excel in a similar line. Nine-tenths of life's failures are due, not so much to an ignorance of methods, as they are to a want of the proper energy to do as well as we know how. So, if I may be able to add my mite in making this an "inspiration meeting," I shall feel amply repaid.

The fruit grower, like the grower of any commodity, is chiefly concerned with two factors, viz., the art of production and the art of selling. Both of these factors must be given due attention if the grower is to attain that degree of success which he should. He may know the fundamental principles of fruit growing and be able to put into the fruit package a strictly No. 1 or fancy article. This, however, does not always insure a return to the grower in keeping with the grade and quality of the product. It is true that high class fruit properly graded and properly packed will often take care of itself and net handsome returns to the grower when placed in the hands of the commission man, or even when placed upon the general market. Unfortunately, however, this cannot always be relied upon, and so we have come to realize that the producer must give serious attention to the art of selling. It is certainly to his advantage that this business end of things be no longer left with speculators who are yearly securing larger returns for their labors than are the growers of the product. It is as much our business to market what we grow as it is to grow it. It is not enough for us as fruit growers to produce fancy fruit; we should see to it that that fruit goes into the hands of the consumer and that the prices paid us are entirely in keeping with those high prices usually paid the commission man or the speculator. That this can be successfully done needs no argument before such an intelligent body of horticultural people as I see assembled here this afternoon. Many of our best fruit growers throughout the country are attending to the business side of their affairs in a business-like way, and as a result of these additional efforts are reaping handsome returns.

The reason why most fruit growers have hitherto given little attention to the selling of their products is because of the fact that their entire energy has been given to the production of the fruit and its preparation for market. Their product is perishable, and where sales cannot be made for spot cash it is often necessary to make consignment to commission firms. Probably no class of business men are more thoroughly condemned or more fully trusted. Millions of dollars worth of produce are sold by them upon honor with scarcely a restraint or check upon their actions except such as may be dictated by policy or their own conscience. It is little wonder then that selfish and dishonest men enter this field of business to the constant annoyance of decent men and that such suspicion as may be engendered by rascality will often attach to the best firms in the same line of business. Good, strong, honest firms may be found in most all cities by inquiry in the proper channels. Let the best be selected for patronage, and then make them your partners.

This is an age of co-operation. Competition has been so sharp and the desire for increased profits is so great that we find nearly every class of business well organized for mutual profit. The world never saw such combinations of capital as have lately been formed, under what we are pleased to call the "trust" system. In some lines of business competition had destroyed profits and a combination was necessary to cheapen the cost of production or increase the selling price of their products, or both.

Let us look at the horticultural situation and see if our present methods are not in need of improvement. As a result of careful investigation, I am convinced that a bushel of peaches for which the consumer pays $1.50, does not net the average Michigan grower over fifty cents! This means that the grower pays twice as much for getting his fruit to the consumer as he receives for his own labor in producing that fruit. Is such a condition fair? What ordinary business is there which will stand such a constant drain and profitably exist?

These facts are probably well known to you all, so that it is very simple to diagnose the disease from which our business suffers. What is the remedy? There's the rub. The threadbare saying, "In union there is strength," has become an axiom, but these abstract propositions are not enough to solve the problem. We want to know *how* to apply the remedy to the disease, so as to get practical results. I know of no better way of showing how co-operation can help us than by telling you of some ways in which it has aided us in the fruit belt of western Allegan County.

One of the first drawbacks that we had to contend with in the Michigan fruit belt was the cost of transportation. The location of our orchards is such that we can patronize either the railroad or the boat lines, but there has been no competition between them. An express company operated over the fruit train for about fourteen years, furnishing very poor service and stubbornly maintaining a six-and-one-half-cent rate on small baskets to Chicago. We had no organization, and the efforts of individuals to get better or cheaper service were of no effect.

The season of 1888 brought such low prices for fruit that it was evident that something must be done, and co-operation was resorted to. The Fennville Fruit Shippers' Association was organized in 1891 and the "Granger System" of shipping fruit was adopted. The success of our association under this plan has been wonderful. We have a local agent of the association who receipts for and loads the fruit into ventilated cars, holding about 2,500 small baskets each, for which he receives $2.50 per car. A special fast fruit train starts from Fennville at six o'clock every evening, Saturdays excepted, for Chicago. The cars are all billed to our Chicago consignee, who does the unloading and attends to the freight, shortages, etc., receiving for this service $5.00 per car.

As a result of this co-operation, we have been able to secure the general adoption of a more or less standard climax package, which has resulted in a saving in their cost of more than one-half. The freight rate has been lowered from the express rate of six and one-half cents to two and one-half cents, and the boat lines having to meet this competition, every shipper in our fruit belt has been equally benefited by the operation of our association, whichever way he shipped. All shortages have been promptly paid, which is quite a different experience from that we had with the express company. The association has actually reduced the cost of packages and transportation to about one-third of what it was under the old plan. It is impossible to estimate the actual amount of money saved by the work of this association, but some idea can be imagined when I tell you that the very first year the association did business it saved one large grower fully $1,000. In one year our fruit section shipped 6,000,000 small baskets of peaches, and the saving to the growers that year was over $200,000.

Not only have we obtained better service at much less cost, but it has been done with a cash profit to the association. This profit, amounting to many thousands of dollars, has been expended in the grading and graveling of our public highways, until we now have reconstructed several miles of first class gravel roads. Before our association undertook this work, 200 or 250 baskets were considered a good load, while now our teams handle more easily 500 to 700 baskets. By our unity of action we have also gotten the railroad to donate 300 cars of gravel for this road building. We find that where a single individual has trouble in getting the ear of the railway officials, the representatives of an organization of 400 shippers receive a most respectful and gracious hearing.

So much for what we have been able to do in reducing the cost of transportation. There is another feature I desire to refer to and that is the way in which our growers have co-operated in the manner of packing and selling our fruit. It is generally conceded that the old method of consigning fruit, to be sold on commission, is entirely wrong and our local horticultural society has been working for some time, trying to establish a local fruit market and get outside dealers to come there and buy. Advertising booklets have been sent out, with the result that we have buyers with us all through the season, and their competition has kept prices fairly good. During the past four years, from eighty acres of fruit, I have not consigned to the amount of $25, but have sold at home at very satisfactory prices.

But there is another form of co-operation which, with us, promises to be of permanent benefit—the central packing house system. We have five of these packing houses in Fennville and although the system is not fully perfected, it has already demonstrated its efficiency in handling and marketing the products of large orchards. Usually six or eight growers combine and erect a packing house beside the railroad. Their fruit is brought direct from the orchards to this central packing house, where it is carefully graded and packed, each grower receiving credit for the number of baskets of each grade. The foreman and packers, having no interest in the fruit, pack top and bottom alike and every basket can thus be guaranteed. Solid cars of one straight grade can thus be purchased any day during the season, and we find that buyers will pay more for this fruit than where they have to drive around the country and pick up a load, of as many grades as there were packers.

The obstacles in the way of this central packing house plan may be mentioned as: First, what may be termed the natural conservatism of the average grower; second, the lack of confidence in his fellows and of the results to be obtained by association and combination of interest; third, some expense in putting up and equipping a plant; and, fourth, enterprise and confidence in the outcome to carry on the undertaking. A rather high order of ability and good judgment, combined with some experience, is necessary in managing such an undertaking, and the manager must command the confidence of his associates and patrons.

The principal advantage is the application of modern and systematic business methods to the fruit industry. Organization is the basis of modern successful business operations, and only those lines of business that are well organized are successful in a marked degree. The statement is often made that an organization among farmers is sure to fail, that farmers will not hang together, etc., *ad nauseam.* I think that the experiment among our packing houses disproves this statement, and I believe that the tendency among progressive fruit growers is toward such organizations. I believe that these separate packing houses will eventually grow into a federation, with a central head, that shall keep in touch with all of the principal markets and keep the units of the federation informed regarding markets and prices,—a fruitgrowers' "trust," if you please.

The packing houses furnish a more reliable and desirable quality of fruit and Chicago prices are obtained for the fruit at the point of shipment, thus effecting a saving of nearly half the expense, as noted above. It is evident that the dealer in Buffalo, who would be willing to pay 75 cents per bushel for a car of peaches in Chicago, of the uncertain and damaged quality that he would get there, would willingly pay the same price for fresh, straight-packed fruit here, as the expense of shipping is no more; and so the grower receives 75 cents at the packing-house for fruit for which the commission man returns the consignor 50 cents. Experience has abundantly proven this self-evident assertion.

I trust that you will pardon me for speaking so at length about what we have done at Fennville, but our successes have opened our eyes to the possibilities of what may be accomplished by a unity of action. If agriculturists could be brought to realize what co-operation might do for them, who could live without paying them tribute? In my experience among growers, I have found among them *parasites* who would oppose co-operation in every form ,for no other reason than that the less his neighbors know, the greater his opportunity to profit by their ignorance.

Co-operation is the beacon light of emancipation to the farmer and the only means by which that traditional fear and suspicion, born of wrongs and injustices as far back as Jacob and Esau, can be dispelled. Where co-operation is the watchword, the community is immune from the adventurer, who figures farmers generally as his legitimate prey.

Member. How do you sell your apples?

Mr. Bassett. We make contracts. Many of our apples were sold this year in July, at from $3.50 to $3.65 per barrel, and I furnished the barrel.

Member. I would like to ask Mr. Bassett if he knows of any successful operation of a central packing house for apples.

Mr. Bassett. No sir, only in the West. Of course, there they have the system in fine shape,—in Washington and Oregon.

Member. Are the orchards pretty closely located?

Mr. Bassett. Yes, they are. The people are simply driven to co-operate. It costs them more to get a package of apples from the Hood River Valley to Chicago market than it costs me to produce our apples. It's this Western co-operation that sets us to thinking, wondering what it's all going to mean. Do not be afraid of their gobbling you up. I believe we have a future; I do not believe they will ever get it away from us, unless we allow them. It will depend on us whether we shall have this business or whether we shall not. They are raising a fancy apple—an apple they can not put upon the market at a cheap price; but you must remember that the large consuming public demand a cheaper apple. They cannot afford to pay the high price; and if my friend Mr. Repp can sell Wine Saps for eight dollars a barrel, I glory in his ability. I am not so sectional, however, as to believe that what is so in Michigan is so everywhere else. But let us all be proud of our country. I am proud of Michigan; I think it is one of the best sections in the country. The lack of transportation facilities and the extremely high price of land out West makes it impossible for them to compete for the cheaper demand. A man who goes out there from here, will have to be satisfied with ten acres where it was customary for him to have a hundred and twenty. He puts all the energy on those ten acres that he previously had put on the hundred and twenty—intensive farming against extensive farming. Could you not get better fruit if you were to concentrate on ten acres the energy you are now expending on say your hundred and sixty acres?

Member. Your road-building; is that independent of the State?

Mr. Bassett. Yes; this road-building is simply a local proposition. If we build a stone road we get some state aid.

Member. How do your fruit growers generally procure their barrels up there?

Mr. Bassett. We have to buy them from the local coopers. A good many growers buy the stock—a car load or two—and have their own cooper shops right on the farm. They make their own barrels in the odd seasons, when they can have them made cheap. When they sell their orchards, they sell the barrels with them.

Member. Does the Fruit Growers' Association help in buying barrels?

Mr. Bassett. Yes, we ship in a great many car loads of barrels when they are shy.

Member. Do you advertise for bids to supply barrels?

Mr. Bassett. No; we go out on the open market and buy outright. We get propositions nearly every day for barrels, and everything else.

Member. Do you box any apples?

Mr. Bassett. We are trying the experiment in a small way.

Member. If you hold that the Michigan Northern Spy has as good a flavor as the apple grown in the Northwest, why should it not pay to buy and box them and market them as boxed apples?

Mr. Bassett. We think it would, but we have not demonstrated it. We have not gotten to the point where we can make a report.

Member. You spoke of pruning and letting the sunlight in; do you prune hard every year?

Mr. Bassett. Yes.

Member. Is that just apple, or peach and apple?

Mr. Bassett. All kinds of fruit.

DISCUSSION OF VARIOUS NURSERY METHODS OF PROPAGATION FOR BEST ORCHARD RESULTS.

By Prof. W. J. Wright, *Assistant in Horticulture, Pennsylvania State College, State College, Pa.*

It is unfortunate that there exists among farmers and fruit growers a general feeling of distrust of the nurseryman. It is still more unfortunate that this feeling is not always without foundation. In fact so general has been the dissatisfaction among buyers of nursery stock that the "tree agent" and the nurseryman have often become the butt of ridicule at horticultural meetings and in the local press, and are tolerated only as a necessary evil. Every farm paper and Experiment Station in the country has probably been the confidant of those who feel themselves aggrieved at the hands of some nursery firm. Sometimes they have a just grievance but more often it is the fault of the buyer or of the "tree agent," for whom the nurseryman is justly held responsible.

A careful inquiry into the cause of this feeling of distrust shows that it is most largely due to trees not being true to name and that a large part of this trouble comes from the careless habit of buying from unreliable firms or of unscrupulous or careless agents without first inquiring into the standing of the business firm or the personal responsibility of the agent. Well established firms having a reputation to maintain, seldom distribute misnamed varieties. The business system of a well regulated nursery is such that mistakes are well nigh impossible and it would be poor business policy, to say the least, for a well established firm with a large investment to willfully send out misnamed trees. On the other hand, there are constantly springing up throughout the country so called nursery firms who are in reality only dealers, and who buy every tree they sell. Such firms have but little invested and do not feel so keenly the need of an unsullied reputation, nor can they be so well assured of the quality of the stock they sell or its trueness to name as can those who grow their own stock or have it grown on contract. The guarantee that stock is true to name, backed up only by the promise to replace trees not found so, is of little value to the buyer who must wait until they come into bearing to make sure.

The danger of getting diseased trees is now reduced to the minimum by an effective nursery inspection. It forms, however, a strong basis of complaint by buyers against nurserymen. In most cases diseases are probably introduced in some other way. Though there is no doubt some danger, it is one of the lesser of the tree buyer's troubles.

Another cause of complaint is that trees received from the nursery are improperly headed. Nurserymen it is true have been slow to accept the idea of low headed trees for very good business reasons on their part. Nursery stock is planted close. The tendency is therefore for trees to head high. Low headed trees require more room, thus fewer trees per acre. Most nurserymen can supply low headed trees if desired. The trouble too often is that the buyer neglects to specify his preference in the order. Yearling trees are always to be had and present the advantage of allowing the buyer to form the head as he chooses.

The substitution of varieties is a practice indulged in even with some of our most reliable nursery firms and is the cause of much dissatisfaction. It is not to be expected that a firm will carry every variety of fruit grown, but they should carry every variety they catalogue. If the order is placed early and no notice is sent that the order cannot be filled to the letter, the buyer supposes that no varieties will be substituted. If, when the order is received, it is found that substitutions have been made the firm should be wired at once and a settlement demanded. In case it is too late or it is otherwise impossible to obtain the desired variety that season, damages could probably be collected.

On the other hand the buyer may delay his order until late in the planting season and then order his trees shipped at once. Under such conditions the nurserymen cannot do justice to the order and the buyer can have but little cause for complaint if the trees are not satisfactory.

In ordering trees the following directions, if observed, will go far toward eliminating many unpleasant experiences:

(1) Order direct from a firm of good standing which grows its own stock or has it grown on contract.

(2) Buy of your local nurseryman if he fulfills these conditions.

(3) Place your orders early.

(4) State specifically just what you want both as to the varieties, and style and class of stock. Don't leave any room for supposition.

(5) Give explicit shipping directions, and state just when you wish stock delivered.

(6) Remember that the purchase price of trees is a small part of the orchard cost. A few dollars extra spent for trees, if it will purchase just what you want, will be well spent.

(7) Make it your business to see that trees are not delayed in transit.

(8) Carry out your part of the contract by seeing that the trees are well cared for on arrival and that they are properly planted.

That there is dissatisfaction with ordinary grown nursery stock cannot be denied and many growers are casting about for a means of overcoming these troubles. Then, too, there is a growing desire among orchardists for so-called pedigree stock—stock of known parentage. Many have tried the experiment of having their stock grown to order by experienced nurserymen. Thus grown, it costs slightly more than common stock, but has not always given satisfaction. In fact there is a growing tendency among orchardists to grow their own trees.

It is not the policy of the writer to advocate this plan in all cases. The operations of plant propagation are simple in the extreme, though not all who attempt it on a commercial scale are successful. In fact the determining factor of a successful grower of nursery stock is a knowledge of plants and their needs. Almost any orchardist who is capable of caring for an orchard and bringing it into bearing should possess that knowledge. Of the two accomplishments, the latter probably requires the greater skill, but the orchardist who attempts to grow his own trees should not be surprised if each specimen which subscribes to his ideal costs him considerably more than would ordinary stock bought from a nursery. The cost price of trees, however, as has already been pointed out, is but a small part of the orchard cost, and if satisfaction is secured by this means it may be overlooked.

The writer supposes that those who may be interested in growing their own stock are familiar with the processes of root-grafting and budding and the methods of securing seedling stocks. If not, they are referred to the Nursery Book by Bailey, probably the best book on the subject, or to Plant Propagation by Fuller, or to various Experiment Station and Farmer's Bulletins on the subject. There are, however, a few points which have been discussed pro and con in horticultural papers for the past few years which might be briefly touched upon at this time.

One of these points is the relative merits of budded, whole root grafted, and piece root grafted apples. Briefly the advantages claimed for each are as follows:

(1) Budded trees are upon stocks which are already growing and firmly established in the soil. They therefore make a stronger growth, they have a stronger, healthier root system and the union of stock and bud is stronger than in the root-grafted trees.

(2) On the other hand the devotees of the root-grafted method claim cheapness because the operation can be performed indoors during the winter instead of outdoors during the summer when labor is higher, and point to the fact that salable trees can be produced one year quicker. Those favoring the use of whole roots claim to secure a stronger tree from the fact that it receives more nourishment than the one grown from a piece root graft. Those favoring the piece root system contend that the only object of the root is to start the scion growing and keep it alive until it can send out roots for itself and that the real object should be to induce the scion to send out roots by giving it only a small stock in order that the tree may essentially be on its own roots. The fact that either system produces good trees is sufficient argument that all are good.

For extremely cold climates where roots are liable to winter injury it is probably the best plan to have trees on their own roots instead of some seedling stock root whose hardiness is not known. In this case the piece root system seems to be best adapted.

Another topic of considerable importance is the relative hardiness of seedling stocks grown from seeds of hardy varieties. There are those who claim that stocks grown from Northern Spy seeds, for example, are resistant to attacks of woolly aphis. This point has not been distinctly proven. From the fact, however, that the seedling rarely reproduces the qualities of the parent variety to any marked extent, so far as fruit and manner of growth is concerned, it can hardly be expected that it will retain this important characteristic of hardiness with any greater degree of certainty. When relatively small numbers of stocks are to be raised, however, it might pay to grow them from seeds of such hardy varieties as Northern Spy, Ben Davis, etc. (Such stocks can sometimes be bought.)

Pedigreed trees, or trees of known parentage, have already been referred to. The idea that stock propagated from trees which are especially fruitful or which bear fruit of exceptional quality will reproduce these desirable characteristics has been gaining much popularity in the past few years, though it has been practiced unconsciously for centuries in the selection of seeds. In graftage, however, sex does not count, which makes of it a different problem. That this characteristic may or may not be transmitted depends probably upon many circumstances, two important ones of which are: (1) Is this particular tree notably fruitful because it is especially favored by external conditions, such as food, moisture, etc.? or, (2) Is this tendency to fruitfulness a reproduction of a characteristic of its parent? If the former, we should expect no transference of the characteristic. If the latter, it is reasonable to expect that the characteristic will be transmitted. In the vegetable kingdom the bud and not the plant is the unit. Every bud is different from every other bud, and if detached is capable of reproducing a similar plant if given the proper environment. Every tree of any one variety is the asexual offspring of a single bud or tree. Occasionaly a certain bud or branch on a tree or plant is entirely different from its fellows. The tree sports, as the horticulturists say. Many new varieties arise in this way. The nectarine is simply a smooth skinned peach, the result of a sporting bud. The King grape is a bud sport of the Concord. Both are propagated by budding or by cuttings, and reproduce their kind. If then, the more fruitful tree is the result of a bud variation, we may expect it to transmit that characteristic to its asexual posterity. If its fruitfulness is due to external influences, such as food, moisture, etc., then it can not be expected to transmit these characteristics to its asexual offspring. In other words, we must know the history of the parent before we can determine whether or not it will transmit such a characteristic as extraordinary fruitfulness to nursery stock propagated from it.

Such questions, the would-be grower of fruit trees for his own use, must take into consideration and decide for himself until more definite proofs are at hand.

Member. How about the insect troubles?

Prof. Wright. The orchardist has as many insect troubles to look after as the nurseryman. It can be sprayed with the same spraying machine as we use in the orchard.

Member. How about growing in a block?

Prof. Wright. Unless we leave out several rows, we have to have a special spraying apparatus.

Member. Have you had an opportunity to see how the French Apple Stock is working out?

Prof. Wright. I know there is a great deal of French Stock being used, and I believe it is good.

Member. Do you prefer trees root-grafted or budded?

Prof. Wright. I prefer them root-grafted.

Member. Why?

Prof. Wright. I was brought up in a country where the winters were pretty severe, and we were pretty particular about using the Long Scion and the short root, so that the trees would be on their own roots. In your climate it is not so necessary.

Member. Will a budded tree come into bearing sooner?

Prof. Wright. I think not.

Member. Do you know of any nurseryman who is producing his own Peach seeds?

Prof. Wright. No, I do not happen to know any.

Member. How many cuts would you make of one seedling?

Prof. Wright. That would depend entirely upon the length of the root.

Member. Do you think the third and fourth would be as good as the first?

Prof. Wright. It would not make as strong growing a tree the first season.

Member. Would you think it any advantage in growing peach seeds in orchard where they are to stay, and budding afterward?

Prof. Wright. It would be an advantage; but there would be the disadvantage of having that ground lying practically idle while the seedling is growing.

Member. Would there be any advantage to the life of the orchard?

Prof. Wright. The tree would not have to be dug up and re-set. If it were grown in the nursery it would lose a half or two-thirds of its roots in the process of transplanting.

Member. In the case of the two roots you showed last, I think I should prefer even the fourth cut on the large root, to the first on the small one.

Member. Is it not evident that the parent of the seedling affects its strength?

Prof. Wright. It probably has a great deal to do with it. It is one of the reasons for one to grow his own seedlings.

Member. Do you not think you would get a better root system from the budded stock than from root grafting?

Prof. Wright. Yes, you probably would.

Member. Do you consider it a very great disadvantage to have any of the roots taken off of the tree?

Prof. Wright. No, I do not; provided the top is pruned to correspond.

Member. If the farmer is to grow his own stock for planting, why would it not be better to develop his seedling before making the union with the variety he wants to inoculate. If you develop the seedling three or four years, you know the character of the root on which you are grafting.

Prof. Wright. It may be a good plan to do that way; but there would be the disadvantage, if you grew the seedling three or four years, that the root system would be difficult to dig and transplant.

Member. What are the fungus diseases of nursery stock?

Prof. Wright. I am unable to answer. I have been in this state only four or five months. Think Mr. Tyson can answer that very well; think he has grown some nursery stock.

Chester J. Tyson. I do not think there are any serious ones except the root gall.

Member. How about Pear Blight?

Mr. Tyson. I have never seen it in nursery stock.

Member. Would you recommend growing Pear Seedlings?

Prof. Wright. I should hesitate to grow my own Pear Seedlings; I would buy pear stock.

Prof. Watts. Mr. Chairman, I should like to say just a little on this subject. There seems to be a great deal of theorizing on the propagation of trees. As the result of experiments made by the Department of Agriculture, it was found by actual measurement of the height of trees planted eleven or twelve years, and measurement of the diameter of the trunks of these trees, that the piece root is just as good as the whole root. The more vigorous the root; the more vigorous the tree will be. If you graft on the smaller piece root, or on the smaller whole root, the probabilities are that you will have a smaller tree.

You have men here in this convention who have had experience in bud selection. Bud selection will be given a great deal more attention in the future than it has received in the past.

Member. There is nothing in bud selection as far as I am concerned.

Prof. Watts. I should a great deal rather take chances in planting an orchard from stock I know something about than from trees I know nothing at all about. Mr. Powell claims that he has a special strain of the Rhode Island Greening, as well as two or three other varieties; and it is held by Mr. Powell and others, that they are superior to others. There is more in bud selection than we think; we have neglected to get it out.

Member. How about root selection?

Prof. Watts. I do not know anything about it.

Mr. Earl Peters. Mr. President: I think this is one of the most important things in Adams County. I do not know anything of seedlings. I have grown some nursery stock. I have watched the conditions in the orchard very closely, and we find something there that has not been answered yet. Whether we can ever answer it is a problem; but I have been thinking about it very seriously for more than a year—the method of selection of apple seedlings. These methods most certainly affect our interests. In a ten-year-old orchard, for instance, we have a certain diameter of tree that we look upon as a standard for that age of trees; but we find, say three-tenths of the trees, standing here and there, with a smaller diameter, far less vigorous, and not yielding nearly so much fruit as the other trees. It is a pretty hard problem to solve.

I would rather have the fourth cut from the seedling of a good, vigorous variety; I would rather develop a seedling for three or four years to find out what it is, than to have the whole root of that other little fellow, and especially when I do not know what it is. I would rather have the fourth cut of a seedling of some good, strong growing red winter sort, than to have the whole root of the other, and more so, if it chanced to be a seedling of a Yellow Transparent and I wanted to top work it to Stark, Stayman, or other winter sort. I have seen tests by top grafting in this section. I have known cases where winter varieties were grafted on early kinds; and when the season for the early variety arrived, the apples top-worked began to drop.

The nurseryman has not been able to command sufficient prices to enable him to handle his goods in this expensive way. If the farmer is to grow his trees and to do his own propagating, let him develop his seedlings for two or three years. If he would grow a hundred for four years, and then were to only get twenty-five that exactly suited him, out of the lot, he could afford to discard all the others and it would pay him.

There are several points to be considered in the selection of seedlings for our orchards here in Adams County—and we are beginning to learn something of the tendencies of trees and growth. We should heed foliage, condition of growth, the nature of the growth, that is, the characteristics of the tree, whether they are strong and vigorous, or whether they are weak and slow growing, whether the foliage is subject to scab and fungus diseases, and whether it is upright in its habits, or whether it is knotty.

Member. Would you regard the vigor of the tree as the most essential thing?

Mr. Peters. Yes; however, it would be better also to discover something of its variety than to select the seeds promiscuously. If the orchardist is to use apple seedlings at all, he is justified in growing his own seedlings. He should not use Summer Rambo and Early Ripe seedlings, if he is going to grow Baldwins, and later winter varieties. If he wants to have an apple with good red cheeks, I do not see how he is going to get it by grafting on Rambo or Baltzley. Live stock is not produced that way.

Member. Doesn't this raise the question of the effects of the stock on the scion?

Mr. Bassett. Now you have gotten into deep water again. Professor Gulley, of Connecticut, carried on experiments there that proved to him, and to others that saw the work, that the actual result of the work on the scion was nil. In regard to this root-graft he said that the root system is simply a feeder for the bud or scion. If the cook in my kitchen is a colored lady, it doesn't necessarily follow that I must develop into a colored man, does it?

Member. If it is sufficient to effect that bud or that scion, is that not sufficient to effect the fruit?

Mr. Bassett. I do not understand that it partakes of the nature of the root; and if you graft on Grime's Golden, I do not think you will get any less color. I know George T. Powell, of New

York, argues that he has a strain of fruit he thinks is affected by the stock on which it is grafted; but the experiments carried on by Mr. Gulley does not sustain that.

E. C. Tyson. Is it not Mr. Powell's plan to set his trees deeply enough to get roots from the scion?

Mr. Bassett. I think so.

Mr. Anderson. Mr. Chairman: I have been listening to the discussion of raising our own trees. I do not think it would be wise for us to undertake it. I believe the average nurseryman is honest. I have faith in him. I believe raising nursery stock should be a special business; I think he can raise better trees at much less expense than the farmer can. Rabbits and mice will get into the little nursery patch and eat it right up. The nurseryman can afford to have a nursery better protected against such enemies; and he can afford to have the best soil adapted to his business. We haven't all got that. I was in a nursery lately where the nurseryman grew his own orchards in order to get his buds and I was much pleased with all I saw. He did not take any grafts or buds from a tree that was not true to its type and a perfect specimen. Trees in the same orchard of the same variety are not always equal in quality. When the nurseryman has his fruit orchards, he can select his buds and grafts from special trees. You see, he is right onto the job, and he can grow that tree better and cheaper than we can do it.

Now, about grafts not coming true to type. I have done considerable grafting, and in only one case was it not true to type.

In these days we must be specialists; and the man who has an orchard and studies his business, is the man who will come out best.

Mr. M. G. Kaines, Associate Editor of the "American Agriculturist." Mr. President: There is one thing that has not been brought out yet. It seems to me there is no question about getting just what you want in the way of selection. If you have, we will say, a Northern Spy tree, or if your neighbor has a Northern Spy, that is better than any Northern Spy with which you are acquainted, you can get buds from his tree at a very small expense. You can present them to your nurseryman, and have him grow the trees for you on the kind of stocks you stipulate. Any nurseryman will agree to raise trees on contract. I happen to know of one nurseryman in western New York who is doing that. He did not at first want to undertake the work himself as a speculation; and so the man who wanted to have a certain class of stock produced, made his contract with this man to produce it. The fruit grower supplied the buds and the nurseryman produced the trees; and so far as I know, every detail of that transaction was agreed to before the work was undertaken. The last report I have had on the subject is that they have been satisfactory to both the nurseryman and the fruit grower. Some of the stock has been planted in the orchard, and is doing well. It happens to be dwarf stock, now in bearing at Mr. George T. Powell's, at Ghent, N. Y. As I said, they are dwarfs —Red Astrachan trees, not quite so high as I am, which have produced a box of fine specimens to the tree,—and they are only three years old.

As to bud selection, I know of Mr. Powell's experiment in growing King trees of particular types. Mr. Powell went all over western

New York to find a King tree better than any other King tree. I do not remember how long he was at that, but for some years. At last he found just the type of tree he wanted; and as he was afraid there would be sun scald or injury to the trunks—the King is subject to that in northern New York—Mr. Powell top-worked the King buds on either Northern Spy or Tolman Sweet bodies; I think the former. The trees have now been in bearing for several years, and the character of the fruit in that orchard is practically uniform. Each package, you may say, is like every other package; every apple like every other apple; and that has a great influence on the sale of his fruit. The fruit is graded before the blossoms appear. You understand what I mean by that? The buds are all from the same individual tree. He has good, sturdy, healthy trunks in his King orchard. The trees are almost alike. They, of course, have been well-trained from the begninning. Now, whether it will pay to top-work on an extensive scale I am not prepared to say. It seems to me there would be a needless check to growth and loss of time. This is shown by the work of Mr. Samuel Fraser, of Geneseo, N. Y. What appears to me as most practical is the selection of buds from specially useful trees of desirable varieties for the locality, and putting these at once upon vigorous roots in the nursery. Mr. Fraser has done this with several thousand trees now two or three years old, I believe, and is well pleased with the looks of his orchard.

INTER-CROPPING OF YOUNG ORCHARDS WITH SPECIAL REFERENCE TO ADAMS COUNTY.

PROF. R. L. WATTS, *Department of Horticulture, State College, Pa.*

The development of young orchards is a business proposition. There is an æsthetic side to the enterprise, but primarily orchards are planted for profit and not for pleasure.

The paramount question in the minds of most prospective fruit growers is, What investment is required to bring an orchard into profitable bearing? Hundreds of people do not plant orchards because of the financial burden in caring for them before they begin to yield returns. On the other hand, a host of men in this state have planted trees with the full intention of giving them the proper care, but have failed largely because the necessary funds were lacking. I am personally acquainted with young men who would like to engage in fruit culture, but the expenditures demanded before there is any return is a serious barrier. The capitalist is just as much interested in this question. Three men from a Pennsylvania city visited State College recently and said they had $25,000 to invest in the development of a great commercial orchard, but they much preferred a plan and policy which would not call for the spending of the entire sum.

Planters should bear in mind that every year added to the age of a well-cared-for orchard of approved varieties enhances its value. There is an increasing number of men who are willing to pay a liberal price for young orchards that have not reached a bearing age, and with this knowledge, growers should not hesitate to plant trees and follow approved methods in their care. Any plan, however, which will reduce the cash outlay in growing a young orchard will be welcomed by all classes of fruit growers.

The Aim.

In the development of young orchards, the aim should be to grow the very best trees at a minimum cost. Any plan of culture which does not have this high purpose should be condemned. The growing of crops between the trees is a secondary matter and should not at any time interfere with such treatment as will result in perfectly healthy and properly grown trees.

Inter-cropping in orchards has not been popular with the rank and file of orchardists, mainly for three reasons. First, it has been claimed that the trees need all the plant food naturally furnished by the soil and any additional amount that the grower might be able to supply, and that the cultivation of companion crops necessarily robs the trees. This is a weak argument and many instances might be cited where ample food has been supplied for both trees and companion crops, which of course is absolutely essential to success, both from the standpoint of the orchard and of the inter-tillage crops. Second, it has been claimed that tillage is interfered with when crops are grown between the trees. This may or may not be true. It depends upon the character of the crop selected and also upon the method and frequency of cultivation. By choosing the right crop and by giving it the right kind of tillage the trees will not suffer from lack of cultivation. Third, the most justifiable reason for not inter-cropping is that it places additional irons in the fire, some of which are likely to be burned. To engage in market gardening or potato culture on a large scale in connection with orcharding requires considerable executive ability. Not all men can succeed in handling garden crops on a large scale and at the same time give the trees proper attention.

Inter-Cropping Becoming More Popular.

In recent years, however, inter-cropping is becoming more popular. It is not difficult to cite instances where the plan has been worked out with entire success. One of the best examples is that of the well known horticulturist, Mr. H. C. Snavely, Lebanon, Pa. Mr. Snavely was formerly chairman of the General Fruit Committee of the Pennsylvania Horticultural Society, and he is recognized as one of the most intelligent and successful orchardists in the state. In 1907 Mr. Snavely planted four rows of potatoes thirty-four inches apart, using the variety known as Carman No. 3, between the peach trees which were set at standard distances. The land previous to the setting of trees was plowed very deep and thoroughly harrowed. Ne fertilizer was used for the trees at the time of planting, but 1,000 pounds of 2-8-7 mixture was applied in drills for the potatoes. Thorough tillage was given during the season. The potatoes were planted April 5th. From twelve acres, 2,000 bushels of potatoes were harvested and the trees made a most satisfactory growth. The trees for this orchard were the largest that could be secured, some measuring eight feet in height at the time of planting. In 1908 potatoes were again planted, but on account of severe drouth, only 860 bushels were harvested. The growth of the peach trees the second season was also satisfactory. I have not heard directly from Mr. Snavely this year, but I understand that he harvested a fine crop of peaches. Mr. Snavely has told me repeatedly that he never saw a finer young orchard.

It is a pleasure to call attention to inter-cropping as practiced by Horace Roberts, Moorestown, N. J. Mr. Roberts purchased his first farm some years ago and was unable to make a single payment on the place. He had barely enough capital to stock the farm with tools and a few animals. The success of his operations is almost phenomenal for he now owns nine farms and he is a comparatively young man. Mr. Roberts is known as an orchardist as well as a market gardener and his success must be attributed largely to inter-cropping in the orchards. The general policy is to buy a farm when the price is right and to plant all or part of it with fruit trees. Peaches, apples, pears, plums and cherries are grown extensively on the Roberts' farm, and inter-tillage crops are used in all the plantations. In a number of instances it has been possible to pay for the places from the profits of two seasons. Expenses of the young orchards as well as of the entire farm are more than paid from the outset, and it should also be noted that the farms become more valuable because of the starting of young orchards and of the improvement in soil fertility. Many other growers within easy reach of Philadelphia markets have been practicing companion cropping with success. The most common practice on the Roberts farms is to plant peas as early as possible in the spring, following with such crops as tomatoes, sweet corn, muskmelons, cucumbers, watermelons, potatoes and other crops that may be sold to advantage in Philadelphia. Most of the farms are about eleven miles from the city and nearly all produce is marketed by wagon.

Principles Involved.

In deciding as to the kind of crop which is best adapted to any particular location, the following points should be considered:

(1) The equipment and capital required. The growing of such crops as peas, sweet corn and potatoes would require a very much smaller outlay for equipment than early cabbage and early tomatoes which must be started under glass. Practically all farms have the tools necessary for the growing of potatoes, although if undertaken on a large scale it would be necessary to secure planters and harvesters, while one could not expect to grow early cabbage and early tomatoes on a large scale without extensive areas devoted to hotbeds, cold frames and perhaps greenhouses.

(2) The natural bent or inclination of the grower should be taken into account. Many people who are very fond of fruit culture would not make a success in growing vegetables because these crops do not appeal to them. This is a most important factor and should not be ignored by the individual or the community.

(3) Inter-cropping requires more labor than when no crops are grown between the trees. This may or may not be a serious

factor. If the grower possesses sufficient skill to make a success in the growing of vegetables or other companion crops he can well afford to pay for labor in competition with other classes of producers.

(4) A most important factor to be carefully considered is the question of markets and marketing. On account of easy access to a large market, the growers of Moorestown possess special advantages over persons operating remote from large centers of population. Although these men are within easy driving distances of Philadelphia, much time of the men and horses is required to cart the produce to market. If a good shipping trade is developed it possesses special advantage in requiring very little time for the delivery of vegetables at the railroad siding.

(5) Some crops which might be grown between fruit trees require more skillful management than others. This factor is well worth the consideration of the orchardist. His time and thought are needed in caring for the trees and if inter-tillage crops can be selected which are simple to cultivate, it will be a decided advantage.

(6) When the growers of a given community desire to engage in the growing of inter-crops, it would be a great advantage to decide upon a few crops that best meet the requirements of the locality. To make such an enterprise a success, those crops should be selected which require the least skill unless there is assurance that more difficult crops can be grown successfully.

(7) Crops should be grown for which there is a large demand. Potatoes are especially desirable because this vegetable is consumed in very large quantities. From the standpoint of demand, cabbage probably ranks second, and tomatoes third.

(8) It is an advantage to select crops that have the fewest enemies to combat and which may be controlled without great difficulty. Looking at the matter from this standpoint, the tomato is one of our best crops, especially if rotation is practiced.

(9) Other things being equal, it is important to select crops which will interfere the least with spraying. Crops with erect habit of growth will permit the use of spray machinery, while those of a straggling nature would not allow the use of carts or wagons without damage to the companion crop.

(10) The location is a most important factor in deciding the crops which should be grown between the trees. It is especially important to select those which are adapted to your soil type. Some crops, as cabbage, have a much wider adaptation than others. The quality of the companion crop will depend largely upon the character of the soil. A large crop of potatoes might be grown successfully on limestone soils, but they lack quality as compared with tubers grown on sandstone. Early tomatoes are smoother and more regular when grown on the lighter soils. The question of exposure should be considered with reference to this problem. In orchards having trees on sunny slopes, the growing of early crops as peas, cabbage and tomatoes might well be considered, while it would probably be futile for fruit growers on northern slopes to attempt the culture of these crops. The steepness of the land must also be considered. It is impracticable to grow on steep hillsides crops requiring frequent tillage.

(11) It is desirable to select crops which have the same fertilizer and tillage requirements as the trees under culture. Cabbage, for example, is not a desirable crop to grow in peach orchards, because it requires more nitrogen than is required by peach trees. On the other hand, there could be little objection to the growing of this crop in apple orchards, provided the soil is well filled with humus. The moisture requirements for certain inter-tillage crops is perhaps the most serious objection to their use. Cabbage, for example, contains ninety-eight and a half pounds of water, and unless the water absorbing and holding power of the soil is great the trees may suffer on account of lack of moisture. This difficulty, however, can be overcome by supplying humus in sufficient quantity and by early and frequent tillage.

(12) Companion crops which make their growth and require tillage early in the season are the most suitable for the orchard.

(13) The duration of growth or time of harvesting is also important. The successful management of orchards requires the maintenance of vegetable matter and those crops which can be harvested and sold before the proper time to sow cover crops are, other points being equal, the most desirable. Peas, early cabbage and early potatoes meet this requirement.

(14) Companion crops should be selected if possible which permit thorough tillage and as late in the season as may be best for the welfare of the trees. This matter can be controlled to a considerable extent by allowing a liberal amount of space between the rows.

15. The net profits from companion cropping should be the main factor in deciding as to what crops should be grown provided the cultivation of such crops is entirely favorable to the growth of the trees. The skillful management of crops which require starting under glass, as early cabbage and early tomatoes would certainly return larger profits per acre than potatoes although the growing and harvesting of the crops would require much more attention.

Directions For Growing Companion Crops.

Sweet Corn, and especially the early varieties may be grown with entire success in young orchards without detriment to the trees. By planting the early varieties in thoroughly drained soils which have been well enriched by the plowing down of clover sods and the application of manure along with high grade fertilizer, the crop would be harvested in ample time to start cover crops. Some of the best varieties for this purpose are Crosby, White Cob Corry, Premo, Fordhook First and Golden Bantam. Later varieties may be grown with entire success, but the crop is harvested rather late for sowing cover crops.

Small Fruits may be used as companion crops in orchards, but are undesirable because they require tillage later in the season than is favorable to starting cover crops. I see no reason, however, why the bush fruits could not be grown in the orchards of Adams County, using each year a legume as cow peas which would be killed by frost and which add materially to the supply of vegetable matter. Soy beans are better adapted to clay soils. They made a much larger growth at State College in Hagerstown clay loam than cow peas. None of the small fruits, however, are generally regarded as good inter-tillage crops for the orchard.

Peas meet the requirements so far as the trees are concerned, better than any other vegetable. They add nitrogen and vegetable matter to the soil when the vines are plowed down and do not draw heavily upon the supply of mineral elements. The earliest varieties should be used and planted just as soon as the ground can be prepared. The largest yields are procured by the free use of seed and thorough cultivation.

Tomatoes, when the bulk of the crop is off before the middle of August or the first of September, is a desirable crop. It is important to use an early variety such as Earliana and grow strong, stocky plants, carrying a cluster or two of flowers, which are set in the field as early in the season as the locality will permit. This is important because yields are larger from early set plants and the profits are certainly larger from the earliest crop. If necessary, nitrate of soda may be used soon after planting to stimulate growth and it may also be an advantage to the trees.

Early Cabbage may be grown without detriment to the trees, provided the crop is manured and fertilized as liberally as possible, to make it a success as well as to furnish the trees with needed plant food. The best variety is Jersey Wakefield, securing seed from a house which has an improved strain. If a larger variety is wanted, use Charleston Wakefield. In Adams County the seed should be sown not later than the middle of January, transplanting to the cold frames when the plants are four or five weeks old, and setting the well hardened plants in the field as soon as the weather will permit. The profits from this crop are large when it is properly handled.

Early Potatoes are exceedingly desirable for this purpose. All points considered, we probably have no crop which is so valuable for companion cropping. The advantages are the small cost of equipment for growing the crop; soil and fertilizer requirements are very much the same as for most fruits; it must have the same amount and the same kind of tillage as is favorable to tree growth; there is a large demand for this product; it is a simple crop to grow as well as to harvest and market; and the crop matures in ample time to follow with crimson clover or other hardy legume. To make the crop a full success, great care should be exercised in preparing the soil and firm seed should be planted as early as possible in the spring. There should be no delay in harvesting the crop after it has reached marketable size.

Chester J. Tyson. Do you think early sweet corn well adapted to the shipping trade?

Prof. Watts. I see no reason why it is not. It is shipped in large quantities to most of our cities before the local crop is ready for market. Our most successful growers count on one hundred dollars gross receipts per acre. The fodder is often utilized for feed, and it is of greatest value perhaps when used as silage. As high as three hundred dollars per acre is realized sometimes when the plants are started under glass and transplanted to the open. So far as the trees are concerned, I see no reason why early sweet corn should not be grown.

Mr. Tyson. Where would you look for a market?

Prof. Watts. Cities in northern districts should furnish a market for a considerable quantity.

Member. Give us a few pointers if you know.

Prof. Watts. The growing of this or any other crop on a large scale in your orchards would probably necessitate organization. It is important for your men to get together and then ship your produce in car load lots, being careful not to flood any particular market.

Member. How is corn shipped?

Prof. Watts. It is best handled in iced cars. If not packed too closely, however, and if the shipping facilities are good, the corn may be packed in crates and ventilated barrels and reach the destination in good condition.

Member. Would you plant raspberries in peach orchards?

Prof. Watts. I am glad you asked me that question. I would not; because the raspberries would give practically no return before the peach trees should need all of the ground.

Member. We were not successful in planting these two crops together.

Prof. Watts. Did the berries thrive?

Member. The raspberries did fairly well, but the peaches did not. The peaches got the yellows.

Prof. Watts. I do not think the raspberries should be blamed for the yellows, but I do not advocate the planting of raspberries in peach orchards. It makes cultivation more difficult, and unless tillage is thorough the peach trees might be come weakened and more subject to yellows. I had apples in mind rather than peaches when speaking of inter-cropping.

Member. Could late potatoes be harvested in time to start a cover crop?

Prof. Watts. If the potatoes are out by the first of September you would have time to start cover crop, especially if rye is used. This crop could be started much later than the first of September and get sufficient growth for safe wintering.

Member. Would the first of September be time enough to sow soja beans?

Prof. Watts. It would be too late, and also too late for crimson clover.

Member. How about rye?

Prof. Watts. This crop could be sown with success as late as the 10th of October and probably later, but there would not be much growth before winter. As the land should be plowed as soon as dry enough in the spring, it is important to secure a large growth in the fall.

C. J. Tyson. Do you think you could grow early cabbage plants to correspond with the ones you buy much cheaper than three-dollars per thousand?

Prof. Watts. I do not think so. I would not like to grow them for much less.

C. J. Tyson. In a community where a dozen growers get together, which would be the most profitable, early cabbage or early sweet corn, either 100 acres of cabbage or 100 acres of sweet corn?

Prof. Watts. I think the early cabbage would be more profitable. It offers greater possibilities, although the sweet corn would probably meet all expenses in developing the orchard. I do not think it necessary to care for an orchard ten years without making a profit on the cultivation of such land. With skillful management, I believe it is possible to buy a farm, plant it with trees and pay for this farm and all expenses incidental to this orchard by the time it comes into bearing. Some men have done this.

Member. In case you plant sweet corn, potatoes or cabbage, how much fertilizer would you use?

Prof. Watts. Sweet corn and cabbage require more nitrogen than potatoes. It is not usual to apply more than 4 or 5 per cent of nitrogen for any of these crops. For early cabbage and sweet corn, a ton of fertilizer carrying four per cent nitrogen, eight per cent phosphoric acid and 10 per cent potash should give satisfactory results.

Member. How should a fertilizer be applied.

Prof. Watts. Most of it should be used broadcast before planting. If the soil is thin, one-fourth of the amount can be used to advantage in the furrows before planting.

Member. How about hillsides and rocky land for inter-cropping?

Prof. Watts. Inter-cropping should not be practiced on such land.

Member. Should you mulch?

Prof. Watts. Yes, I should mulch land that is hard to cultivate, but it is doubtful whether mulching is effective in growing peaches.

Mr. Anderson. The orchard should be cultivated both ways.

Prof. Watts. This could be done by planting in check rows.

Mr. Anderson. How far apart would you plant potatoes?

Prof. Watts. They could be planted 30 x 30, with careful marking and a steady horse to cultivate. Several pieces should be planted in each hill.

Member. You cannot use a machine in planting if you put several in a hill.

Prof. Watts. This is true, but hand planting is not such a tedious operation as some suppose. It is not many years since practically all our potatoes were planted by hand and a few highly successful growers of to-day prefer hand planting.

Member. What kind of fertilizer do you recommend, especially for large trees?

Prof. Watts. I think you have some orchard men here. Professor Wright, will you answer that question?

Prof. Wright. As a matter of fact, if I were fertilizing an orchard, especially a cultivated one, I should try to use a leguminous crop every other year in preference to buying nitrogen. Of course a fruit crop does not require as much nitrogen as a grain crop, but most of our soils are deficient in phosphorous and potash. If I were growing an orchard of my own, I should not put on much fertilizer in the form of nitrogen, but should expect to get that from cover crops. I would supply the phosphates and potash in about equal quantities. I do not think you can afford to buy nitrogen when you can buy it in the form of leguminous crops.

Member. What does our Michigan friend say about that?

Mr. Bassett. In our orchard management there is one thing about this leguminous crop that appeals to us more than any other. We have tried to get results from Clover in one year, but have failed in this. The trouble is that it does not mature sufficiently in a season to take up and store very much nitrogen. It would not do to put the clover in in the fall and plow under the next spring,—the little nodules that secrete the nitrogen have not matured sufficiently to contain much of it. We give the clover an extra season to mature, and then turn it under. This we do about one year in five. The others we have clean tillage. We usually use phosphate also, in the form of bone; and these are the most satisfactory; but, as the professor says, we cannot afford to buy nitrogen at the present price, when we can grow cover. We usually try to grow clover in our Baldwin orchard the year of its non-fruiting, and this sometimes interferes with the setting of the fruit buds.

Member. Do you use Mammoth or Red Clover?

Mr. Bassett. We use both.

Member. Did you ever try the crimson clover as a cover crop?

Mr. Bassett. It is the crimson we use.

Member. Do you get plenty of nitrogen from the Mammoth?

Mr. Bassett. We get nitrogen; but they do not mature sufficiently to be turned under the first season.

J. W. Anderson. Mr. Chairman: I would like to say a word about Crimson Clover. We are considerably father south than our Michigan friend. In our section (York County) we are not much farther south than you, in Adams County, and in this latitude Crimson Clover will make such a growth in one season that it will be a great benefit to the land. A good many farmers sow Crimson Clover in their corn at the last working. I have seen circular patches in the oats the following season where the straw was much shorter than that surrounding it, caused by the Crimson Clover being smothered, in the fall, by the corn shocks. I am afraid Crimson Clover has been greatly neglected. It will do you a lot of good to grow it. I know this by actual experience, and there are many others who think as I do on this subject.

Prof. Watts. I would like to make one point in connection with Crimson Clover. It should be started early.

Mr. Anderson. The last working of corn does well with us.

Mr. Repp. It is the practice in Freehold, N. J., to follow the potato crop with Crimson Clover.

SOME EXPERIMENTS WITH COMMERCIAL LIME SULPHUR AS A SPRAY FOR FRUIT DISEASES.

By H. H. Whetzel, *Professor of Plant Pathology, New York State College of Agriculture.*

During the winter of 1908-'09 there was much demand from fruit growers for recommendations regarding the use of lime sulphur solutions as a summer spray. Plant Pathologists generally, particularly here in the East, advised growers to go slowly. If they desired to try these solutions experimentally on a few trees, good and well; but all were advised against the general use of this on the foliage of their trees, until pathologists had time to determine whether this could be done with safety and efficiency. The experiments of Cordely in Oregon using the home boiled concentrated mixture, and the work of Scott of the U. S. Department of Agriculture with his self boiled lime sulphur, had been reported in the Horticultural press and our Eastern growers wanted to know why it wouldn't work here. This demand for information on the subject was the more pressing for the reason that many growers had experienced heavy losses from burning or russeting of the fruit by the Bordeaux. Naturally they were interested in a substitute that appeared to be equally effective and at the same time free from the faults that condemned the Bordeaux.

In order to get some data on the value of lime sulphur as a substitute for Bordeaux when used under our conditions in the State of New York, we undertook a series of experiments in an orchard near Ithaca, in the spring of this year (1909). Mr. Wallace, a Fellow in the Department of Plant Pathology, had charge of this work and to him belongs all the credit of the remarkable progress we have made on this problem this season. What I shall here report is chiefly the results of his work.

The work was conducted in two orchards containing several varieties of apples, trees about 15 years old, with peach trees as fillers. Work on three diseases only were undertaken, namely, Peach Leaf Curl, Apple Scab, and Brown Rot of the Peaches. A field laboratory was established at Mr. Frear's place, in whose orchards the work was to be done. Commercial Lime Sulphur (Niagara Brand, heavy grade) was used as this was what Mr. Frear had already purchased for his winter spraying. Mr. Frear furnished all materials, gasoline power sprayer, etc., and Mr. Wallace assisted in all the application made. The work was very thoroughly done.

Results on the Peach Leaf Curl.

In these experiments comparisons were made between Bordeaux 3-3-50 and different dilutions of the Commercial Lime Sulphur. On account of heavy winds that blew constantly it was impossible to spray the trees from but one direction. However as thorough a job as possible under the circumstances, was done. The applications were all made before the buds had swollen to any appreciable extent. Unsprayed check trees were left in every series of experiments. The results showed that the Lime Sulphur at any dilution from 1 to 9 to 1 to 20 was more effective than the Bordeaux. The curled leaves on the unsprayed trees averaged from about 35 to 60 per cent, while on those sprayed with lime sulphur they averaged from 1 to 6 per cent only. On the trees sprayed with the Bordeaux an average of about 8 per cent of the leaves showed curl. More copper in the Bordeaux might have been more effective. These results are not especially new or striking, as it has long been known that lime sulphur as applied for scale will also effectively control the curl. They serve, however, to again confirm the results of earlier investigators and to demonstrate to the grower the value of lime sulphur for the control of this disease. This is particularly important, as most growers are now compelled to spray for the scale and any solution that will answer both purposes at the same time means a great saving in time and money. Reports from a large number of peach growers all over the state, last spring, indicate that any of the brands of commercial lime sulphur or the home boiled mixtures used as for scale will successfully prevent the leaf curl.

Results on Apple Scab.

The trees selected for these experiments were Rhode Island Greenings. The lime sulphur was used at a dilution of 1-30. The Bordeaux was made to the formula 3-4-50. In *each* case arsenate of lead was used at the rate of three pounds to 50 gallons of the mixture. Six trees were left unsprayed as checks; six were sprayed with the Bordeaux and arsenate of lead; five were sprayed with the Lime Sulphur and arsenate of lead. The two mixtures were applied in each case on the same day, with the same pressure (about 125 pounds) and with equal thoroughness. Some of the trees were sprayed once, just before the blossoms opened. Some were sprayed twice, just before the blossoms opened, and again just after they had fallen. Some were sprayed but once, just after the blossoms had fallen. The results showed that in this orchard this season, the one spraying just after the blossoms fell was the all important one. The trees sprayed only just before the blossoms opened showed nearly as much scab as the checks. This does not indicate, however, that this spraying just before the blossoms open may not often be

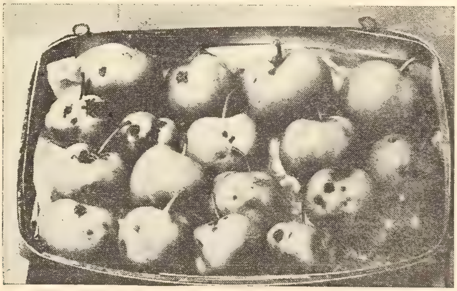


FIG. 1. Greenings from the unsprayed check trees showing the fruit just as it run on the trees. All of these apples were taken from a single limb. All of the injury is not due to apple scab. Insects were responsible for much of the injury. 42 per cent. of the apples on the check trees were affected with the scab.

very necessary. The apples on the table there indicate very well the average run of the fruit on the checks, the Bordeaux sprayed and the Lime Sulphur sprayed trees. Careful counts of all the apples on all the trees in the experiment showed at picking time that 42 per cent of the apples on the check trees were scabbed (See Fig. 1), on the Bordeaux trees this was reduced to 3 per cent, and on the Lime Sulphur trees to 3.6 per cent. The Lime Sulphur was practically as effective in preventing the scab as was the Bordeaux. However, 82 per cent. of the apples on the trees sprayed with Bordeaux were russeted, i. e., injured by the mixture, and to so severe an extent as to much reduce their market value (See Fig. 2). The apples sprayed with the Lime Sulphur showed less than 4 per cent of russeting of any kind, in striking contrast not only to the Bordeaux injured fruit, but also to the apples from the check trees, which showed 29 per cent of russeting, due perhaps to certain weather conditions. Why the Lime Sulphur sprayed fruit should have been so free from this natural russeting is not clear. No injury of any kind either to fruit or foliage resulted from the applications of the Lime Sulphur at the dilution of 1 to 30 (See Fig. 3). The experiments showed that no addition of

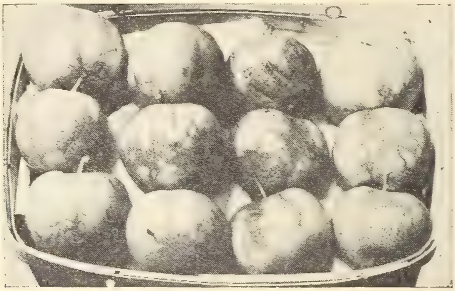


FIG. 2. Greenings from the trees sprayed with Bordeaux and arsenate of lead. In the same orchard with the check trees shown in Fig. 1. Scab reduced to about 3 per cent., but about 82 per cent. of the fruit badly russeted. All the fruit in this basket taken from one limb of the tree and shows the fruit about as it runs on the trees.

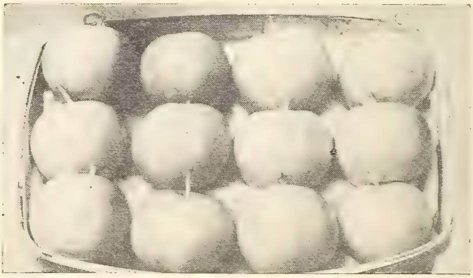


FIG. 3. Greenings sprayed with Lime Sulphur and arsenate of lead. From a tree planted in the row next to those sprayed with Bordeaux and arsenate of lead. Scab reduced to about 3 per cent. Less than 4 per cent. showing traces of russeting of any kind. All the apples from one limb just as they run on the trees.

arsenate of lead to the Lime Sulphur not only did not cause injury to the foliage, but was as effective in controlling coddling moth as when used with the Bordeaux. The check trees showed 25 per cent wormy apples, while those sprayed with the Lime Sulphur and arsenate of lead showed but 1.3 per cent as compared with 3.3 per cent on Bordeaux sprayed trees.

Both Cordley and Scott report good results with Commercial Lime Sulphur for apple scab this past season. Cordley used the Niagara Brand, and Scott used three brands in his work,—the Grasselli, Thomsen Chemical Co., and Rex. Scott used arsenate of lead with the Lime Sulphur with safety, but had burning of the foliage where Paris Green was used with the Lime Sulphur. Scott's Self Boiled Lime Sulphur also gave excellent results for apple scab.

Results on Brown Rot of Peaches.

The results with the Lime Sulphur for Brown Rot have not yet been gotten together so as to give definite figures. Mr. Wallace found early in the season that a dilution of the Commercial Lime Sulphur of 1-100 seriously burned peach foliage. Later he tried a dilution of 1-200 with no injury to the foliage and with a marked reduction in the amount of rot in the fruit. Three sprayings reduced the rot from three to five times. The applications were made about ten days apart, the last being applied shortly before picking. The commercial solution at this dilution has the advantage over the self boiled mixture of Scott in that it is much less expensive and will not stain the fruit. It can be applied the day before the fruit is picked.

We are not recommending the general substitution of Lime Sulphur in place of the Bordeaux. We give you the results of one season's work. If you use the Lime Sulphur on your trees this coming summer it is with the risks involved in using a solution not yet thoroughly tested out, and whose peculiarities under different weather conditions is yet to be determined. That the Lime Sulphur has powerful fungicidal properties is certain. That it will not injure apples (when properly diluted) under conditions that produces russeting by the Bordeaux is shown by Mr. Wallace's experiments. That it is very probably the coming spray is not to be disputed in the light of the favorable reports from experimenters in the different fruit sections of the United States this season.

Member. Is it just as safe to mix arsenate of lead with the self-boiled mixture as with the Commercial Lime Sulphur?

Prof. Whetzel. Yes.

Member. Do you know what time Scott makes his application for Peach Rot?

Prof. Whetzel. No, I do not. I think he sprays from three to five times, beginning at the time the fruit is about the size of a hickory nut.

Member. Professor, do you think, if you had an orchard of 40 or 50 acres of peaches, you would spray with the self-boiled or with the Commercial Lime Sulphur?

Prof. Whetzel. I would spray with Scott's self-boiled—he has used it three years. With the Commercial I would risk enough of my trees to see what would happen. I do not recommend that you use Commercial Lime Sulphur on any of your trees, because, if anything went wrong, you would say, "Whetzel got me into that trouble."

Member. What can you tell us about this fire-blight on Apples and Pears?

Prof. Whetzel. I cannot tell you anything, except what has been told hundreds of times. As I told a man this morning, I will guarantee to deliver a hundred acres of Pears or Apples without the loss of any trees, or large limbs; and I will do nothing except to inspect the trees regularly and take the blight out as fast as it appears.

Mr. Repp. I do not believe in warm weather this can be done; the thing is, your infections come together; they are there before you can see them.

Prof. Whetzel. Yes; but it can be seen in time to save the trees.

Mr. Repp. In this warm section here, the bacteria works fast. I can see how it can be done in New York State; it does not work as fast in that section as in this.

Prof. Whetzel. The people in New York wouldn't believe it could work faster anywhere else.

Mr. Bassett. I agree with Professor Whetzel that it can be controlled in this way.

Mr. Vincent. I know of a case in Southern Oregon where the fire blight attacked a large orchard. The owner said it could not be controlled by cutting it out, consequently he did not fight it. His neighbors fought it, cutting it out wherever it appeared. They conquered it; he lost 15,000 trees.

Mr. Repp. Your method may be all right in your State; in this and New Jersey the trouble is that it starts in the bloom.

Prof. Whetzel. That's where it always starts.

Mr. Repp. How many men would you put on the work?

Prof. Whetzel. How many men could you put in your orchard?

Mr. Repp. Five or ten.

Prof. Whetzel. You could put in twenty if you had to, couldn't you?

Mr. Repp. But, Professor, you go over the trees, and think you have cleaned them all up; the next day you go out, and they seem to be as bad as they were the day before. You have to go back every day; you get discouraged, you lose faith.

Prof. Whetzel. You have to go back every day until it is cut out. I know how you feel when the blight's been after you. They all feel that way.

Mr. Fenstermacher. Professor Whetzel says his boys can tell the blight before the grower would see it; will he kindly give us some information, so that we could guard ourselves and protect ourselves?

Prof. Whetzel. If you will go with the boys and learn the trick, you can do it. There are certain early symptoms. As a matter of fact, an ordinary grower would not be likely to see it until the tree was half dead. The careful grower cannot see it much sooner than from seven to ten days after infection. An expert—a blight chaser—can tell it in from five to six days. He could tell it in its very early stages. It causes a slight wilting of the tip. I know that Mr. Repp is skeptical. We would like to show him. I know I am safe. He is in New Jersey and I in New York, you see.

Member. How would you treat canker?

Prof. Whetzel. It depends on the kind of canker.

Member. The kind that makes a spot rough and black on the limb.

Prof. Whetzel. Is it particularly black and rough before the bark peels?

Member. Yes, the bark itself runs a circle.

Prof. Whetzel. That's almost certainly the New York Apple Tree Canker, caused by a fungus. Black Rot Canker, or New York Canker, is common in Western New York, the Northeastern United States, and West as far as Iowa. It is very common. It is started by the fungus getting into some wound. It very frequently follows fire blight. The general opinion of the fruit growers in Western New York is that where they soak the limbs and body of the tree with Bordeaux Mixture, they are not particularly troubled.

Member. Would Lime and Sulphur control it?

Prof. Whetzel. I do not know.

Member. What treatment do you advise for the Collar Rot?

Prof. Whetzel. I would advise that you go over your trees carefully and frequently, and inspect the base of the trees. If you find there are spots in the bark, cut them out, disinfect and paint until they heal.

Member. What disinfectant do you use?

Prof. Whetzel. Mercuric chloride—corrosive sublimate.

Prof. Whetzel. Perhaps you people would be interested in the methods we are now using in the Department of Plant Pathology to solve the plant disease problems in the State of New York. All of the investigation work during the growing season is now being done in Field Laboratories in different parts of the State. We had seven of these Field Laboratories last season. Each man in the department who has a piece of investigation on hand (and every man in our department has his problem) goes into the particular locality where the disease he is studying is most apt to be abundant. He takes with him a full equipment of laboratory apparatus, microscopes and materials, so that he can do everything that could be done in the laboratories at the college. And there he is right in the midst of the enemy, where he can see the disease in its various stages of development every day during the growing season. He learns to know the disease in its natural relations to the crop and the weather conditions which affect it so markedly. He also learns the crop, the diseases of which he is studying. He gets the grower's point of view. He at once sees that measures which he proposes for controlling this malady must be not only theoretically correct, but practically possible and profitable. He puts on his overalls, and blue shirt; he rolls up his sleeves; he tramps the orchard or fields in rain and blistering sun; he learns to live and deal with men, the men whose problems he is to solve; he learns to respect the grower's experience. And the grower, what of him? Four of our seven field laboratories were supported last season by the growers, financially supported by them, you understand. One was maintained by a fellowship established by the Niagara Sprayer Company. If a grower puts money into a proposition of this kind he expects to get it out. He takes interest in the work which the young fellow is doing. He too gets a better acquaintance with this fungus that is giving him trouble. He sees it through the microscope. He understands now the necessity for all these bottles, tubes and trinkets which the young plant doctor uses daily. He studies the weather forecasts and recording instruments with as much zeal as the doctor himself. In short, he feels that this is his problem and he wants to know how it is solved. Better still he learns to respect and value the skill and training of the college man. He sees the many difficulties and obstacles that stand between the plant doctor and the solution of the problem. He learns to be patient with the slow progress and to make the most of every small gain. I believe that the Field Laboratory is the best means of working out the cause and control of the diseases of our crops. It brings together in sympathetic co-operation the two men, plant doctor and grower, who together must meet and solve the problems. That this financial co-operation has met with the approval of the growers is evidenced by the fact that in every case they have arranged to continue and increase their support for another season. The Department of Plant Pathology is thus training a fine corps of men, specialists on the diseases of the particular crops, who will thus be able to quickly and effectively work out practical methods of control. These men will become invaluable to the growers of the State and will well deserve their share of the prosperity that comes to the growers whom they serve.

Member. Mr. President: I should like to have you read question eight, and have Professor Whetzel bring out the difference between Bacterial Collar Rot and Fungus Collar Rot, and to give the authority for calling it by that name.

Prof. Whetzel. I do not know; no one has ever determined but what they are one and the same.

Member. Will Mr. Bassett kindly answer the first question on the program—How to Hurry a Young Apple Orchard?

Mr. Bassett. I am sorry I cannot do that; I shall be unable to answer that. Hurry in bearing, I suppose you mean?

President. Mr. Bassett declines to speak on this question; would Mr. Vincent kindly take up the topic—What is the Best Way to Hurry an Apple Orchard?

Mr. Vincent. My advice would be not to hurry slow-bearing varieties. You should grow varieties that come into bearing early—Wagner or Duchess—one you know will come into bearing early.

Josiah Prickett. Will some one kindly answer question twelve—Would It Pay a Man with a Ten Acre Orchard to Purchase a Power Sprayer?

Member. Josiah Prickett, I think, can answer that question best himself.

Mr. Prickett. I do not think it is customary for the man that asks the question to answer it. I have been interested in power sprayers. I am about changing off—getting another sprayer. I am interested in the subject, and would like to have some information on the subject. I am following up the Compressed Air Sprayer and am just young in that business. If anyone has a Compressed Air Sprayer, I should like to have it discussed.

Mr. Bassett. I notice the question refers to a 10-acre orchard —presumably a 10-acre bearing orchard. I have seen excellent work done with a hand sprayer; but I believe that a man who has a 10-acre orchard can afford a power sprayer. The nature of the sprayer is open to a big line of argument. We have a gas sprayer, in which the power is furnished by liquid carbonic acid gas with pressure. That has been very satisfactory. The only trouble has been that when we came to use the Lime Sulphur Spray, the carbonic acid has broken down the solution. Gasoline engine outfits are also satisfactory. Sometimes they get mulish; you can't tell just what you are going to get out of a gasoline engine. They have better ones to-day. There are a number of good outfits on the market. As to air compression, of course it is the same principle as the Niagara Gas Sprayer, using compressed air, instead of gas.

In Ohio they have a large number of power sprayers, and the growers work together very nicely. They have central power stations, where a number of people go with tanks. They have two tanks—one for the liquid to spray, and one to contain compressed air, just the same as carrying grist to the mill. They have a powerful engine. They can buy their compressed air cheaper than they can make it. You go to the central station; there you will find a man in charge, who has it in readiness. You simply drive up and get your compressed air. You have your other tank filled with the spray material; and you are all equipped to go to work. Where a man has his own individual plant, he has a central station on his own place.

You have your engine to run your compressor, your compressor to run the sprayer, and your tank to hold the spray material. The one objection to a power sprayer in an orchard, is that the machine weighs considerable. When the frost is just coming out of the ground, this is quite an item. You have quite a load to carry, especially where the engines are heavy and you have large tanks. We have changed our notion as to tanks. Where we formerly had 250 gallon tanks, we now prefer tanks not over 150. We have our stations not so far from our orchards, so we can go back easily. This plan is a much better one than to carry such an immense load. My opinion is that the power sprayer has come to stay. If men want to raise fruit successfully they need a power sprayer. We need more power in applying our spray materials. The proper time to spray is when the blossoms stand up straight. If we stand underneath and shoot the spray upward, we are failing to hit the vital point. We use elevated platforms and nozzles set at an angle to the spray rod. In this way we are able to throw the spray down into the calyx, taking care of fungus diseases, and also making our first fight against the coddling moth. When the calyx is partly closed, it is too late to try to squirt poison into it for your coddling moth. We are going to use more power than we can get from a hand sprayer, and we must apply our spray from above, so as to get the poison into the calyx.

Member. What pressure do you use?

Mr. Bassett. About 200 pounds, where we were formerly satisfied with 125. The old hand machine never gave over 85 pounds, and that under the manipulation of a good, strong, healthy man; more frequently than not you got less than 40 pounds. Another thing, if you will use a hand machine, for goodness sakes don't use only the middle inch of the plunger. Hump yourself a little, or get your man to do it, and use the whole cylinder.

Member. What nozzle do you use to apply the poison?

Mr. Bassett. We used to use the Vermorel. We now use a nozzle something like the Friend. There are a number on the market. It is a heavy nozzle with several discs, which can be inserted easily. The type is the same as the Friend nozzle. It is called The Scientific; has been liked very well this year.

E. C. Tyson. Do you think that will take the place of several Vermorels?

Mr. Bassett. Yes, we formerly used four in a cluster of Vermorels. This one would do the work of several, and do it better.

Member. How about the amount of power required for that nozzle?

Mr. Bassett. We put on just as much power. You can generally tell by the hiss of the spray.

Member. Would it be satisfactory used with a hand pump?

Mr. Bassett. Yes; with a good, strong man pumping.

Member. Do you think a hand pump will work one Scientific nozzle all right?

Mr. Bassett. Yes; but you have to have a *MAN* at the end of the handle. The old Vermorel is likely to clog; the Scientific does not clog as much.

W. C. Tyson. I should like to know in the case of compressed air, how agitation is provided. When you have two closed tanks,—one for compressed air and the other for material, how would you agitate any material, Lime Sulphur, for instance?

Mr. Bassett. The Martinsburg people put an agitator in them; some are provided with power agitators, some with hand agitators. Some machines are provided with an exhaust, so that part of the material returns to the tank and keeps it stirred up.

Member. I would like to hear from Eli Garrettson as to how his power sprayer works.

Mr. Garrettson. I have had it in use only one season and a half. It has been very satisfactory. I used it on lime and sulphur this fall with good results, and the expense was trifling. I used up a good pint of gasoline to a hundred gallons. I had no trouble with the engine; it has never balked on me; it has been very satisfactory.

Member. I have heard that scale can be removed from the fruit by spraying; has anyone had that experience? The insect marks the fruit; before the fruit is ripe you can see it. Can that be removed by spraying?

A.—Member. I used Scalecide.

Member. What time of the year did you use it?

A.—Member. About a month before picking.

Member. Did it leave any bad effects on the fruit?

A.—Member. No.

Member. What strength did you use?

A.—Member. 1 to 25.

Member. I would like to have Professor Whetzel answer Number 5.

Chairman. What is the cause and remedy for the irregular hard spots in apples, causing them to be irregular in outline, and often rendering the fruit worthless?

Prof. Whetzel. This injury is supposed to be caused by a small, red, sucking insect, which Prof. Slingerland called the "Red Bug." Prof. Slingerland was engaged in investigating the Red Bug just before his death; in fact, he died before he concluded his work. The Red Bug punctures the fruit when it is quite small. In some sections the damage it has done has been considerable, especially to Greenings. Many of the knotty apples, according to Prof. Slingerland, are caused by this insect. The small red bug, as it grows larger, becomes very lively. We have not had very good success in controlling it.

Mr. C. J. Tyson. Does that cause a discoloration of the skin on the outside?

Prof. Whetzel. It simply depresses it; if you cut the apple, you will find it more or less woody down under the flesh.

Member. The skin is comparatively perfect on the outside?

Prof. Whetzel. Except for the small puncture.

Member. Has the skin a similar color to the rest of the apple?

Prof. Whetzel. I do not know.

Member. Do you find it on the Ben Davis?

Prof. Whetzel. Yes.

Member. Smith Cider has the trouble this year.

Member. Is the damage caused early in the season?

Prof. Whetzel. Yes; when the apples are quite small.

Member. Did Prof. Slingerland work out any remedy?

Prof. Whetzel. No; he had only completed—not quite completed the life history at the time of his death. The insect must be killed by contact spray. Even when quite small they will jump off of the tree to the ground, and come back after spraying is over; when they get older they fly. We have not been very successful in controlling this bug.

C. J. Tyson. There is another trouble—we have a great deal of it here, especially have we had it during the past two or three years. It occurs like a bruise or welt, rather a depression than a welt, the skin of the apple not being broken, and it having a red color, redder than the rest of the apple, and the flesh underneath is a dry corky rot.

Prof. Whetzel. Yes; it is a disease, commonly called the Baldwin Spot; it occurs commonly in New York. It attacks also other fruits than the apple. It looks like a dent in the apple. The flesh is dry and spongy.

C. J. Tyson. Now, I do not believe that is the trouble I am referring to. The one I referred to affects the whole side of the apple; and so far as I have seen it, the apple never gets dark on the outside, like the Baldwin Spot.

Prof. Whetzel. I am not familiar with it.

C. J. Tyson. It looks like a limb bruise.

Prof. Whetzel. No, I am not familiar with that at all.

Member. Is there a remedy for the Baldwin Spot?

Prof. Whetzel. Not so far as I know. A lot of work has been done on it all over the world. Nobody has a remedy for it.

Member. (Shows apple.) What is this on the outside of the apple—small dents like this.

Prof. Whetzel. That looks like the Fruit Spot. This disease has recently been worked upon by Dr. Brooks, of New Hampshire. In order to distinguish it from the Baldwin Spot, it has been given the name of Fruit Spot. It is a fungus disease. You can peel back the skin and take out a piece of it, and get the fungus to grow in cultures. It can be controlled by spraying with Bordeaux mixture, making the spraying about July. It depends upon the weather. And right here, a great many of you have developed the habit of spraying according to spraying calendars. You must remember that conditions in different parts of the country, and even in different parts of a state, vary considerably. More damage has been done by spraying calendars than the pathologists can correct in a long time. Spray according to the condition of your fruit at a given time, and the weather conditions. Spray according to the stage of development of your fruit. Some people begin spraying, for instance, on the south side of the orchard, or on the east side, without stopping to think that some apples blossom earlier than others. As regards the weather, spray *before* rains, *not after.* Rain will not wash Bordeaux Mixture or Lime Sulphur off of our trees. Every fungus that causes disease, is scattered *during* rains, and infests the fruit. It gets into the fruit *during* rain, and *not before.* We want the poison on the fruit or leaves when the rain comes.

PRACTICAL DEMONSTRATION IN THE BOXING OF APPLES.

By C. C. Vincent, *Asst. Horticulturist Oregon Agricultural College and Experiment Station, Corvallis, Oregon.*

The box apple trade has been given more attention in the great distributing territory, east of the Rocky Mountains, this year, than ever before. For several years commission men in all the large cities pursued an attitude of indifference in regard to the bushel boxes, which are so much in evidence in the Pacific Northwest. But so much fruit has appeared in the eastern markets in boxes, that eastern dealers are obliged to recognize it.

Mr. E. P. Loomis, a prominent dealer in New York City, says: "The tendency of our association is too much an association of barreled apples." "I believe packing apples in boxes is an advance in the industry." I honestly believe that if the boxing of fruit was resorted to, it would do away with the fraud and deception that is practiced with barreled fruit. It would necessitate the handling of number 2 apples as number 2's. The time is not far distant when many of the most progressive growers in the East will market their fancy fruit in boxes.

The recent New England fruit show, held in Boston, has been a step in the right direction. It has demonstrated the fact that eastern fruit when placed in boxes, compares very favorably with the western boxed fruit.

The sales indicate a growing demand for boxed fruit. While on the demonstration fruit train, which ran through the fruit growing sections of New York, a commercial orchardist stated to me that he had received $2 per box for his Dutchess apples this season. A commercial grower in the Hudson Valley sold some fancy apples for $3 per box (f. o. b.), local railway station. What these men have done, others can do, if proper care and attention is given the selection of the fruit.

Those who are unfamiliar with western methods wonder why it is that the growers are able to receive such large prices for their fruit each year. It is a well known fact that they have been and are receiving as much per bushel box as the eastern growers are receiving per barrel—3 bushels. This fact is especially true in the London and Liverpool markets.

The reasons are obvious. The English buyers know that every apple is uniform in size and shape. They can depend upon the western boxed fruit as to quality. Thus they can afford to handle this fruit at a much narrower margin of profit than apples in barrels.

What has been done in the West can be done here in the East. Right here in this locality, if the progressive growers will band together. This organization is a step in the right direction.

From what observations I have made in New York and also in Pennsylvania, I find that you *can* grow the fruit. Your exhibition has demonstrated that fact. The color of your fruit is excellent. The next problem is the placing of this fruit on the market in the most profitable way. The solution to this question, I believe, will be the adoption of the bushel box.

This morning I will give a practical demonstration in the boxing of fruit, as is practiced on the Pacific Coast. Such points as picking and grading will also be briefly discussed.

When to Pick.

The time to pick the Spitzenburg, or any red apple is usually ascertained by its color. Many growers make the mistake in picking ihetr fruit too green. Fruit lacking in color is usually a drug on the market. With flesh colored apples, like the Newtown, etc., the time of picking is regulated by the coloring of the seeds. In general though, any variety is ready to be picked when the stem separates readily from the spur. The breaking off of the spurs should never be tolerated.

Orchard Boxes.

Just before the harvest begins the orchard boxes are scattered along the rows. This avoids unnecessary delay in the operations.

Member. What is the shape of those orchard boxes?

Answer. Similar to the box the fruit is packed in. They hold about a bushel, and are made of a little heavier material than the packing box. Cleats are placed on the ends, so that the boxes can be piled one upon the other. I do not advocate the use of the packing box for orchard purposes; new clean boxes are preferable for the marketing of the fruit. Put a dirty box, filled with apples on the market, and notice the effect. The crew of men who are under an orchard foreman are supplied with the necessary picking receptacles, ladders, etc., and then the work begins.

Member. What do you pick the apples into?

Answer. Many of the growers use galvanized iron pails. They are of such a size (10 in. x 10 in.) that they can be lowered into the box, thus eliminating the bruising of the fruit to a very great extent.

Member. How about a bag?

Answer. Personally, I am not in favor of the bag; for in climbing up and down the ladder, and in stooping over, the fruit is very likely to get more or less bruised.

Chester Tyson. It is customary here to use the half-bushel drop handle basket.

Member. Is the pail round?

Answer. Yes.

As soon as the orchard boxes are filled with fruit, they are taken immediately to the packing house. The fruit is never allowed to remain exposed to the sun's rays for any length of time.

Packing Houses.

These vary in size and shape, according to the whims of the orchardist. In some instances I have known men to use large tents for this purpose. In the construction of packing houses there are a few points well worth mentioning: One requisite is light; by all means have plenty of windows in your building. Another is plenty of room. Build a large, roomy house.

Grading.

The apples, on their arrival at the packing house, are placed at the ends or in the center of the building. A crew of men begin immediately to sort the apples. I have here a sizing board (Shows board about 6 inches wide and 2 feet long, with a row of holes through the center, varying in diameter from 2⅜ inches to 3⅜ inches in regular sequence), which represents the different sized apples that are put up in boxes. This board (See Figure 10) is placed up in a convenient place, before the sorters. As soon as the grader has trained his eye, and this it will not take him long to do, he will be able to

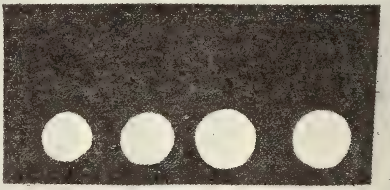


FIGURE 10—GRADING BOARD

(Courtesy of "Better Fruit.")

discard the grading board for the most part, and can tell at a glance if a certain apple is going to fit in a certain pack. If in doubt, he holds the apple up to the hole, but never drops it through. Some men, the grower finds, soon adapt themselves to this method and become very proficient graders. But, just as you have found in barreling, some men will never learn how.

Packing Table.

The packing table, which stands before you (See Figure 1), represents a style of table that is used quite extensively throughout the West. The table is about three feet high, three feet wide, and three feet long. The uprights are made of 2 inch x 4 inch material; sides, 1 inch x 6 inch. The legs are beveled off so as to leave no sharp edges to bruise the fruit. The top is covered with canvas, which is allowed to sag or hang rather loosely. To serve as a double protection to the fruit, rubber hose is nailed around the top of the table. A board nailed across the end and one on the side of the table, serve to support the box, which is placed on an angle.

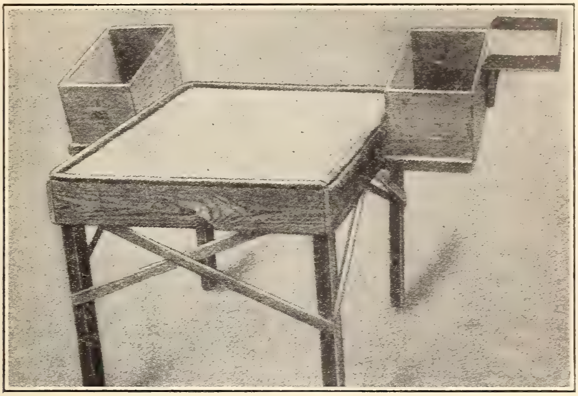


Fig. 1. Packing Table in General Use. (Courtesy Better Fruit.)

Box Material.

Pine or spruce appears to be the best material for boxes. This material is delivered to the grower in shooks. He makes his own boxes. An expert can put up from 200 to 300 per day. Cleats are placed on the tops and bottoms of the boxes. Cement coated or barbed nails are used. We have two sized boxes in general use in Oregon; one is known as the California Special—this box that is before you,—having inside measurements 10 in. x. 11 in. x. 20 in.; the other is the Standard, having inside measurements of 10½ in. x 11½ in. x 18 in.

Details of Packing.

Uniform sized apples are brought to the packing table. The packer now begins his first operation, i. e., the lining of the sides of the box with lining paper. This is nothing more or less than common white wrapping paper, which is just a trifle smaller than the length of the box, and about 26 inches in width. The ends are very seldom lined. The next step is to put in the layering paper. A sheet of paper is placed between each layer of apples, and also on the bottom of the box and on the top before the lid is nailed on. If the California Special Box is used this paper would be 10¾ in. x 19¾ in. in size. It serves a purpose, as it has a tendency to hold the apples more firmly in place.

The hood is now hooked over the side of the box to hold the paper. The wrapping paper varies according to the size of the apple. For three tier and three and one-half tier apples, 10 in. x 10 in. paper is large enough. Smaller sized apples will wrap up very nicely in 8 in. x 10 in. paper.

A monogram is stamped in the center of each paper. This usually contains the grower's name. The paper is prepared by a certain process; one side is smooth and the other side is left a little rough. This rough side is placed next to the apple.

Wrapping the Apple.

Every packer has his own way of wrapping an apple. I pick up the paper with my left hand, thus, with the corners diagonal, and with my right place the apple in the center, bringing the outer edge of the paper over the apple, then turning it, thus bringing the smooth surface up and the bunch on the bottom. This serves as a cushion. The apple is now placed in the bottom of the box. Repeat the performance until the layer is finished. Then place in the layering paper. Continue the operation until the box is filled. Every apple in the box is wrapped. To aid the packer in the picking up of the paper, a rubber band is placed over the thumb or fore-finger. An expert can put up from 50 to 100 boxes per day. His ability of course will vary with his practice and training in that line.

Styles of Packs.

At the present time there are two styles of packs, known as the square or straigt and diagonal pack. In the square pack the apples are placed one upon the other. In the diagonal pack (See Fig. 2), there is less danger of the apples bruising in transit, as no one apple rests upon another, but fits in between the four apples below. Undoubtedly before many seasons pass, the diagonal pack will be the one most largely used. If only the two sized boxes were used, all apples could be packed diagonally. For instance, all the apples that would pack square in the California box, could be packed diagonally in the Standard box. The 3 tier, 4 tier, and 5 tier apples will pack up in the square pack. The 3½ tier, 4½ tier, can be placed in the diagonal pack.

The classification of the apples contained in each box, as is designated by the tin labeling, is as follows:

3 Tier Apples in the Standard box, 45 to the box.
3 Tier Apples in the Special box, 54, 63.
3½ Tier Apples in the Standard box, 64, 72, 80, 88.
3½ Tier Apples in the Special box, 96, 104, 112, 120.
4 Tier Apples in the Standard box, 96, 104, 112, 120.

4 Tier Apples in the Special box, 128, 144.
4½ Tier Apples in the Standard box, 150, 163, 175.
4½ Tier Apples in the Special box, 185, 200.
5 Tier Apples in the Special box, 200, 225.

Unless the apples have been properly graded beforehand, no such system of classification can be obtained. Probably the best place for the 5 Tier Apples, is at the evaporator or cider factory.

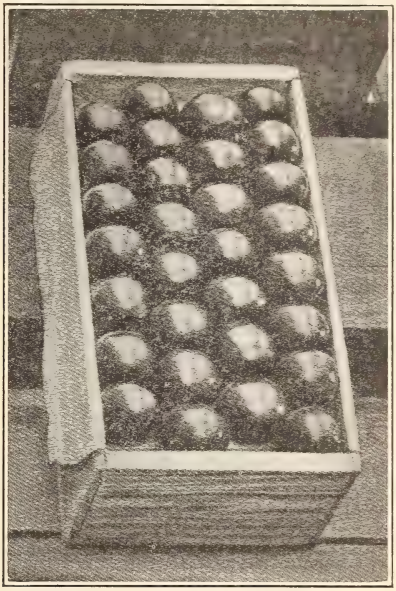


Fig. 2. Celebrated Diagonal Pack.
(Courtesy of "Better Fruit.")

Mr. Bassett. In the diagonal pack, are you not selling a lot of empty spaces, instead of apples?

Answer. No; if the apples are properly graded, the spaces are confined to each end of the box.

Starting the Packs.

Very little trouble will be experienced in starting the square pack, i. e., if the apples have been properly graded. With the 3 Tier Apple, which is 3⅜ inches in diameter, it requires 3 apples to fill up the space across the bottom of the box, or in other words there will be 3 rows in width and 3 layers in depth. The 4 Tier Apples require 4 rows in width and 4 layers in depth.

The diagonal 3½ Tier pack (See Fig. 3) is started differently. In this style one gets 3½ rows in width and 4 layers in depth. The first apple is placed in the lower left hand corner of the box, another apple is placed in the center. The following two apples are pressed firmly in the places which are left. This is sometimes called the 2-2 pack.

To start the 4½ Tier pack, place the first apple in the lower left hand corner of the box, another in the lower right hand corner, and another in the center. Two apples are then pushed down, as far as possible in the spaces that are left vacant. The 4½ Tier pack is also known as the 3-2 pack.

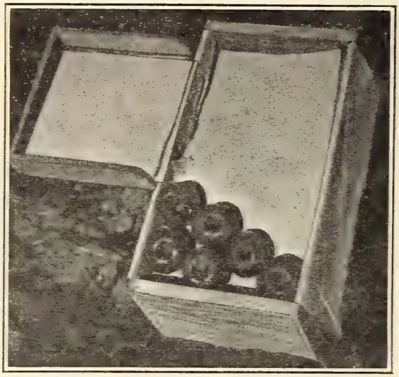


Fig. 3. Method of Starting 3½ Tier Diagonal Pack.
(Courtesy of "Better Fruit.")

The Bulge.

Inexperienced packers will have some little difficulty in getting the proper bulge to the box. Practice, however, will obviate this. When the fruit is packed, the apples at both ends should come up flush with the top. In the center they should extend a little higher. (See Fig. 4). There is more or less of a gradation between one sized apple and another. For instance between the 3 Tier and 3½ Tier. To obtain the proper bulge, which should be from 1 to 1½ inches, the packer selects apples that are a trifle smaller for the ends, working those that are a trifle larger to the center. In case the apples are of the same size and are being packed on the cheek, in order to obtain the proper bulge, the end apples are turned with the stem ends up. Every box of fruit should have a swell (See Fig. 5). As soon as the box has been filled it is taken to the nailing press (See Fig. 6) and the cover placed on.

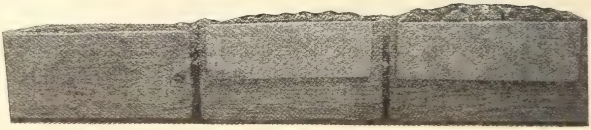


Fig. 4. Left Box Too Flat, Middle Just Right, Right Too High.
(Courtesy of "Better Fruit.")

Lithographs.

On every box is placed a neat, attractive lithograph. This adds very much to the appearance of the box, and aids materially in selling the fruit. A cheap, gaudy label detracts rather than adds to the appearance. A lithograph should contain the grower's name, the name of the locality, and also the name of the state where the fruit is grown. For instance, 'Bendersville, Pa." Let "Pennsylvania" stand out in bold relief. If this is done and the box contains fancy fruit, the grower will soon establish a reputation for himself.

On the other end of the box is stamped the number of apples in the box, the packer's number, the grower's name, and the word "fancy." Every consumer on buying a box of apples knows that he is getting a definite number.

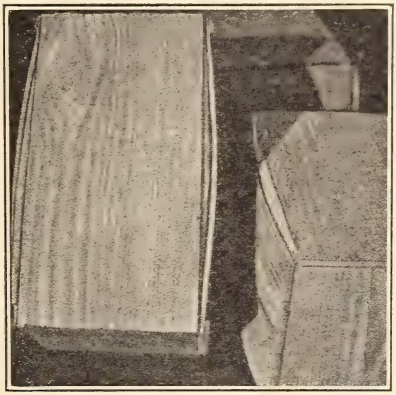


Fig. 5. Side View of Boxes After Nailing, Showing Proper Bulge in Top and Bottom.
(Courtesy of "Better Fruit.")

Question. How are boxed apples going to be placed in the car without bruising?

Answer. The boxes are placed on their sides. Cleats are laid between the layers, thus allowing for the spring of the car.

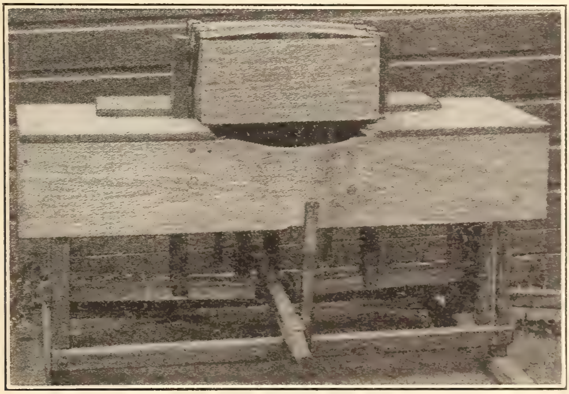


Fig. 6. Nailing Press. (Courtesy of "Better Fruit.")

Question. Is there any difference in carrying, whether the fruit is packed on the end or on the cheek?

Answer. There may be, but it can hardly be avoided if the proper bulge is to be secured. Certain varieties, like the Spitzenburg, pack up better on the cheek.

Question. How do you make the layers come out?

Answer. Each style of pack has a definite number of layers. Examples: The 3 Tier pack always has 3 layers; 3½ Tier 4 layers; 4 Tier 4 layers; 4½ Tier 5 layers.

Question. Would you not have to pac ksome tiers both ways, a couple of tiers on the calyx end, and several on the cheek?

Answer. Yes, that is done. If the fruit is being packed on the cheek, and the packer finds he is not going to get the proper swell, the middle layer is turned.

Question.—Mr. Bassett. Does the man who does the packing, do the grading?

Answer. No.

Question. What does the grading cost?

Answer. The graders are paid by the day.

Question. Do the graders use tables?

Answer. The fruit is usually graded from one box to another. This avoids unnecessary handling.

Question. About what is the net cost of putting up a box of apples?

Answer. Packing costs 5 cents; box material, from 10 to 12 cents; wrapping, lining and layering paper, 1 cent. Probably 18 or 20 cents would cover the cost.

Question. The York Imperial has two rather distinct forms we find running together; a flat apple and one quite the reverse. The apples might caliper the same, yet be difficult to pack. How could this be managed?

Answer. You would probably have to make separate grades of the two forms. The long type would pack up nicely on the cheek, while the flat type could be packed better with the stems up.

Question. Those individuals who have adopted the box system out there, have they eliminated the barrel system altogether?

Answer. Yes.

Question. Do the men out there ever get any good sized apples that do not have color enough to put up in boxes?

Answer. Everything is packed in boxes. If the fruit is a little off color, a large L is stamped on the end of the box.

Question.—Mr. Bassett. What constitutes a number two?

Answer. Blemished to some extent.

Question. What do you mean by blemished?

Answer. An apple affected by hail; small scabby spots, worm punctures, etc.

Mr. Bassett. One trouble about the adoption of the package in the East seems to be that the commission men discourage it.

Answer. This has been done laregly in the past, but I believe the commission men are now forced to recognize the box package here in the East.

W. E. Grove. What kind of wood do they use for the boxes?

Answer. Pine or spruce. Soft wood. I do not think the growers will have any trouble in getting the material. Maine, I understand, has from 21 to 22 billion feet of standing spruce.

Mr. Bassett. Do you buy the material knocked down? That is, buy the shooks and make the boxes yourself?

Answer. Yes. The material costs from 10 to 12 cents, knocked down.

C. J. Tyson. A grower in New York told me he could bring box wood from the Pacific Coast as cheaply as he could buy in New York, and get more satisfactory material.

Question. How do you keep posted on market conditions?

Answer. Through the Association. Some days telegraphic communications at the Hood River Valley Association would amount to $100. An individual could not afford that expense; but to an association having 200 to 300 members, the expense is very slight. Mr. Paulhamus, President of the Puyallup Fruit Growers' Association of Washington, stated that just before they began to market their fruit, one man was stationed in Seattle, one in Spokane, one at Boise, Idaho, etc. All these men make daily reports as to market and climatic conditions. If it was found that a car of small fruit was going to Boise, Idaho, and that it was very cold at Boise, and very warm at Spokane, the destination of the car would be changed and be sent to Spokane instead. The destination of the car is changed according to climatic conditions, slumped markets, etc.

Question. Is it possible to grade apples into different sizes by machines, and if so, describe the machine and operation.

Answer. I do not know of any machine that is offered for sale that would be applicable for the grading of apples.

The orange graders I hardly believe would answer the purpose, as there would be too much bruising of the fruit.

SPRAYING FOR SAN JOSE SCALE AND CODLING MOTH.

(STENOGRAPHIC REPORT.)

PROF. THOMAS B. SYMONS, *State Entomologist, College Park, Md.*

Mr. Chairman, Ladies and Gentlemen: I congratulate the members of this association on having such an active county organization. I indeed consider it a great privilege to be with you this morning. As Lincoln, not far from this spot, urged his fellow countrymen to save the Union, so I urge you to wage relentless war against injurious insects.

I gave your secretary the subject for this morning's talk rather hurriedly, and I would ask the chairman not to hold me strictly to the title of the address, as I wish to mention at least one other insect that is of considerable importance at this time.

As to the San Jose Scale and the Codling Moth, I shall simply try to supplement the work that your most efficient entomologist, Prof. Surface, is doing in this State. I congratulate the growers of Pennsylvania that they have been able to get the State to sufficiently appreciate the importance of this work to appropriate at least $40,000 for the control of injurious insects and plant diseases. The State is really up-to-date in that respect; and I hope that other Eastern States will appreciate the importance of the control of these pests. From the standpoint of co-operation, I tell you men, individually, we are a mighty small proposition among 90,000,000 of people. It is only by combining, as you gentlemen are doing, that you can get the results you desire; and in order for the farmers to get their just results, it will be necessary to combine to compete successfully with those interests that also combine. And the sooner the farmers of the East and West appreciate that point, the sooner they will get a more just reward for their efforts.

In discussing the San Jose Scale, I recognize that you men are up-to-date, and have been spraying for San Jose Scale for many years past. I believe that the men whose faces I am looking into, have long since appreciated the fact that they are not afraid of the San Jose Scale; that it can be controlled. We have learned that. The only point, and the prevailing question that is asked to-day in regard to the San Jose Scale, is: What solution is the most effective, the easiest to apply, and the cheapest. We have learned the most effective solution. The home-made Lime Sulphur wash has been thoroughly established as an efficient remedy for this pest; but the question confronting the farmers and fruit growers of to-day is to get a solution that is effective, is also easy to apply, and cheap.

The conditions governing the application of spray materials are of considerable importance in emphasizing the ease of application. The labor problem is presented to every farmer; and if he can get a remedy which he can have easily applied, and more satisfactorily applied by his laborers, he is after that solution. The manufacturing people appreciate that condition, and have been constantly putting on the market various solutions looking towards the control of this pest. They finally learned that the growers wanted to use Lime Sulphur, and they have now put on the market several brands of Lime Sulphur Solution. I would say my remarks upon the different solutions are based upon my experiments conducted during the past two years in orchards. I wanted to know, first, whether a concentrated lime sulphur solution would be as effective as a home-made one; and in order to learn that it was necessary to test it on the trees. I have done this for two years,—the past year more extensively than the previous one; and from the results of the past year, so far as we could observe from careful examination on Peach and Apple, sprayed in fall and spring, it seems that some of the concentrated solutions have compared favorably with the home-made wash. They have done all that is to be expected of them, both on Apple and Peach. I'll have to admit that the past season has been a very easy one, so to speak, for the solutions to control the scale. We had an exceedingly dry season in this part of the world, and, as you know, the Lime Sulphur remedy controls the scale, by virtue of its lasting qualities on the trees,—rather than the immediate effect when applied,—and by having less rain, the wash remained on the trees, and thereby cleaned up the little tiny crawling young reproduced in June and July. So, I would preface my remarks by saying that this is simply one season's work; and as fruit growers, you will not put your dependence in any one season's work in anything; but so far as we know by the past season's experience, I believe the concentrated washes will compare favorably with the home-made; and it is a question that the individual grower must decide—whether he wishes to use the concentrated wash. Personally I have always been a crank on Lime Sulphur. I recognize in Lime Sulphur that we are applying something that cannot hurt your trees, no matter who does the spraying, or how it is done. I also recognize that it does not spread quite as readily as the oil; and that's the only point in favor of the oils that makes them advantageous on Apples; and in my experience, covering ten year's of experiments, I have been able to get just as good results from Lime Sulphur on Apples as from the oil; but I grant you it requires more thorough work. The San Jose Scale is harder to control on the apple than on the peach.

Several Brands of Lime Sulphur Were Used In Our Tests.

Practically speaking, they are about on the same basis, and practically speaking, it is up to the individual whether he wishes to use the commercial compounds or to make his own Lime Sulphur. If he has gone to the expense of buying a boiler, the latter is decidedly the cheaper wash. It is in my opinion the best wash when you make it properly; but in considering the labor, the trouble in making it, the commercial solutions offer quite an inducement to use them; and my advice to the fruit growers is to simply put it on a financial basis. If you have a man that will handle and make the home-made, and you have everything for making it, I should certainly use it. If, on the other hand, you do not wish to go to that trouble, you have the concentrated wash from which you certainly can reasonably expect the same results.

Member. What dilution, Professor?

Prof. Symons. I would recommend 1 to 9; in bad cases 1 to 8.

E. C. Tyson. Do you not think that the matter of time, being able to spray promptly when the winds are favorable, would be very much in favor of the concentrated solution?

Prof. Symons. You mean that it would take time to make the solution? Yes, there is that advantage. Furthermore, I think that people who have been spraying for years, have yet much to learn. None of us know it all; and the man or woman who thinks he or she knows it all, might as well quit. We think we know something about spraying. I believe we have a lot to learn, even at this time. Certainly a great many of us do it in the hardest and most disagreeable way. It reminds me of a story I heard last week down in Baltimore. Mr. Shemberger, of Baltimore County, is trying to get the Baltimore Countians together, working on the Good Roads Movement. He said a good many of the backwoods farmers were a great deal like the old man and his son that kept quite a number of cattle. In the arrangement of the stable, they had the bull in the first stall as you came into the stable. This bull had the peculiarly pernicious habit of kicking as you passed by him—every time you went by him, he kicked. One day a visitor came, and they wanted to show him the cattle,—the cattle were kept at the other end of the stable. On entering the stable the injunction he received was: "Look out for that bull; that animal will kick you; we always have to be very careful in going by here." "Look here, my friend," said the visitor, "would it be any trouble to move that bull down into the last stall, and put the cows up here?" "Well, I declare," said the man, "I never thought of that; father always kept him in the first stall, and I did not like to change him."

It's just these little things that we have to learn. And in spraying it's all foolishness to have your men and teams all covered up with spray material; it's up to the growers to work out this problem. Study it, and always work to advantage. And that brings in the time of application. We have done considerable work in spraying—spring and fall. I think you can spray just as well in the fall as in the spring.

Member. Have your results been better?

Prof. Symons. Our results have shown no appreciable difference. Have always advised spraying in spring, merely because I think the wash remains on the trees a longer time in summer. Furthermore, in treating with Lime Sulphur wash, I think you are getting more fungicide effect than you would in the fall. I believe there is some difference there. In spraying tests it is mighty hard to tell the difference.

A word in regard to oil sprays. I have nothing against oils, save the fact that I do not believe they are good for the Peach Trees. I am very much like the old darkey in regard to oil. A darkey congregation was holding services in an old church; a storm struck it, and put the church in a pretty rickety condition. The following Sunday, the congregation assembled. The preacher gathered his flock about him, and was about to begin services when he discovered Maria standing outside under a tree. "Why, Maria, come in to service," said he. "No, sir; no, sir; boss," said Maria, "I trustes the Lord, I do; but I never fools with Him." So, I do not like to use oils on Peach trees. Understand me; I agree, you can spray with pure kerosene oil, and do it without injury, if you are careful and do the work yourself; but if left to your men to do, there is the possibility of injury. I know of one man, who I had thought would soon be the Peach King of the Eastern shore. The last time I was at his place he had about eight thousand peach trees. Happening to meet him a year or two later, I asked him about his orchard during our conversation, and his surprising remark was, "I haven't a peach tree on the farm." "What's the matter?" said I. "What in the world have you done?" "You know," he said, "when things don't go right, I pull them out." "Yes, I know," I replied. "Had scale," said he, "and sprayed with Target Brand."

There are lots of people who have sprayed with oils and gotten no injury; but we are running somewhat of a chance on peaches.

Mr. Adams. Does the damage show itself around the collar?

Prof. Symons. No; usually by killing the smaller twigs inside. I know of a man who lost half of his crop in this manner. Oils can no doubt be used on apples with satisfaction. We have gotten just as good results from oils—soluble oil—"Scalecide," this past season as we did with the Lime Sulphur. To show you the condition,—that the people are in doubt as to what they should use, I received a letter from some fruit growers in Virginia the other day, asking what I thought of San-U-Zay; that they had not received good results from the concentrated Lime Sulphur Solution on Apples; and that they had about made up their minds to spray with oil. They especially wished to know about San-U-Zay. Knowing that I had tested many of the oils, they asked my opinion.

I wrote something as follows: "Last year we tested San-U-Zay, and it was absolutely worthless. Last fall we sprayed with San-U-Zay, and also in the spring. The fall treatment killed the scale and did no injury to the trees; the spring treatment killed the scale, but did injury to the trees." I wrote them that the evidence had led us to believe that the San-U-Zay could be used on apples, as in our test the fall treatment did not do any injury.

Member. That is not a miscible oil, is it?

Prof. Symons. The San-U-Zay is not exactly a miscible oil, because you have to use Sal Soda in mixing it. In the first year they did not tell us to use Sal Soda, and we went ahead with the regular directions, and did not get results. I wrote to Mr. F. G. Street the other day, and asked him for another sample of oil. He said he had decided to discontinue sending out five-gallon samples to experiment stations; that he did not consider it a fair test; and having such a great business, did not desire to do any more work in that line. I simply acknowledged the letter and gave him my views in the matter.

Member. I had a little experience with that company. I read their circulars, and thinks I, it's all right, sent for a barrel. When the barrel came, I saw the directions to put some Sal Soda in. I had expected a material ready to put on the trees. I was disappointed, and asked that they take the barrel back. They did not want to do it; but I told them I did not want to bother mixing oils, and would pay the freight both ways. They then took the barrel off my hands.

Prof Symons. The sooner the farmer appreciates the fact that he should not believe everyone that comes along with a silver tongue, the better it will be for him. It is absolutely useless for men to try on an extended plan a solution that they know nothing about. That is the value of the experiment station. The five-gallon experiment is a small one; but everything is on an equal basis, and is made as nearly perfect as can be under the circumstances. It does give me a better opportunity to answer a man's question with partial intelligence at least. If a man writes in to me and says, "What do you know of San-U-Zay?" and I write back to him, "Do not know anything about it," he gets my letter and says, "I'll try it." If I can tell him that I have tried it, and had good or bad results, I do give him a fact to go by. That's the reason I test these solutions. It is very tedious at times. We have learned, however, that what the farmers want to know is—What is effective along with ease of application?

Geo. Fohl. If you boil Lime Sulphur, what proportions do you use?

Prof. Symons. Twenty pounds lime; 15 pounds sulphur.

Geo. Fohl. How long do you boil it?

Prof. Symons. Three-quarters of an hour, or until it has produced an amber colored solution.

H. M. Anderson. Does not the color of the solution depend on the lime you use?

Prof. Symons. No; usually on time of boiling.

H. M. Anderson. Are you sure?

Prof. Symons. Yes; if you get a good quality of lime, it gives less sediment, that's all.

Geo. Fohl. Is the amount given right for fifty gallons of water?

Prof. Symons. Yes.

Member. How do you boil it?

Prof. Symons. Get a small boiler, or steam engine, or anything of the kind. If you have an orchard of a thousand trees, a vat, costing five dollars, can be made out of wood, with tin bottom, that will serve. Make a hole in the ground and set it over. Boil twenty gallons of water; pour in part of the lime, then add the sulphur—mixed into a paste—then the balance of the lime. After it has been boiled for three-quarters of an hour, add sufficient water to make fifty gallons.

L. M. Myers. Have you ever had any injury from Scalecide on peach trees at the recommended strength of application in your experiments?

Prof. Symons. No, not in my experiments; but I have had reports of such injury.

L. M. Myers. At the recommended strength?

Prof. Symons. Yes. I heard of two or three cases year before last—the injury was slight. I do not know whether it was due to the season or not. Scalecide is one of the best oils on the market; but I hesitate to recommend the use of oil at all on peach trees.

L. M. Myers. In your experiments, do you find that you can kill a larger per cent of scale with Lime Sulphur than with oil?

Prof. Symons. In our tests, yes; but I know of a great many people who have had a different experience from that. Now, for instance, as a striking illustration, I know of a prominent orchardist near Hagerstown, who sprayed his apples with Thomsen Chemical Company's Lime Sulphur Solution, and did not secure good results. I have learned, however, that he had this Lime Sulphur put on by laborers on the farm, and that it was a very inefficient and poor job of spraying, and did not give good results. You have got to spray more thoroughly with Lime Sulphur than with oils. We picked out an awful orchard for our test this past year, and got good results.

W. H. Black. Does the commercial Lime Sulphur spread any better than the home-made?

Prof. Symons. I hardly think so. In using the concentrated I always like to add a little lime. I usually add a little over two pounds of lime in the form of milk of lime, to one barrel of the Lime Sulphur. It enables you to see what you have done. Before I added the extra lime I could not see where I had started or where I had left off; and that's the reason I advocated the use of milk of lime.

Mr. Eldon. Is there any other advantage to be obtained from the use of milk of lime?

Prof. Symons. There is no advantage, except in seeing where you have sprayed, and it may aid in prolonging the effect of the Lime Sulphur.

Mr. Eldon. If it stays on, it is that much of a deterrent?

Prof. Symons. Yes, sir. You are killing scale by the causticity of the solution. It kills not only the dormant scale; but the crawling scale that comes later, is also killed by this prolonged action. We looked at the trees in June and found them badly infested; we looked at the same trees late in the summer and found ninety per cent of the scale killed.

A. I. Weidner. Will Lime Sulphur not have a tendency to drive the young crawling scale onto the fruit?

Prof. Symons. I would not think so, Mr. Chairman. I would not think so. Of course, there may be a point in that. I would much rather take chances on a twig effectively sprayed with Lime Sulphur, than on a twig with nothing on it whatever, because the scale that has come out, is hunting for an easy place to put its beak. They will crawl for twenty-five hours looking for a convenient place to insert their beaks. Of course, if the fruit is near, they will infest that.

A. I. Weidner. I have not made a careful examination; but late in the season, just before picking time, the scale developed considerably on the fruit. I do not know how it is on the limb—I have not examined that, I have been sick, and was not able to do it.

Osage Orange Hedge.

Prof. Symons. Another thing I want to call your attention to, is the fact of the Osage Hedge being a common breeding place for the San Jose Scale. I believe you do not have much of this Hedge in this county. Maryland has large quantities of it. The Osage Orange Hedge is a dear one to any farmer. It is a nuisance. It is a make-shift fence at the best, and cannot be counted upon to turn cattle. It is expensive to keep in shape, and certainly the work of trimming it is very disagreeable work. The expense of keeping it in shape will be more than that of replacing it with a good wire fence. It draws on the land ten to fifteen feet for food and moisture. Finally, I have made careful observations of the Osage Hedge in Maryland, and have not seen one that was not infested; and they simply serve as distributing points to other places. I certainly urge men to eliminate this form of hedge from their farms. Washington County has considerable of it.

Peach Lecanium.

The Peach Lecanium, or Terrapin Scale, is a pest we have known for the past half a dozen years, but one that we had not looked upon as being a serious pest, or which we had entertained any doubts of being able to control. The past season, however, has changed our opinion on it. It has spread rapidly in Maryland. I I know of one case, from responsible hearsay, that it occurs in Pennsylvania. I understand that Mr. Wertz has an infestation in his orchard. I do not know as to other conditions in the State. I know, however, that in our State it has caused considerable loss to the smaller growers this past season, and I ask you all to look out for it. You will observe that it is a tiny scale, but much larger than the San Jose, belonging to a larger class of scale insects. San Jose is a hard scale, the Lecanium is a soft scale. In 1907 we observed this pest in Maryland, and in one orchard at Smithsburg it was starting on a few trees. So I had one of my assistants take up some work on it.

We had previously had infestation at College Park on plum trees. It was not until 1908 that it was found to be indigenous to Pennsylvania, New York, and some of the Western States, and most of the States east of the Mississippi. It seems to have a general range of distribution, and has not been of any marked importance except during the last year. It was found to affect the plum and peach tree primarily, but will also be found in others, as, for instance, the sycamore and oak. In the plum orchard at the college, it was found that there was a fungus there that cleaned it out; and that started our work in the orchard at Smithsburg. I will cite briefly the manner of injury by this pest. It does not do its injury as does the San Jose Scale. The San Jose Scale does its injury by devitalizing the tree, sucking the juices of the tree, and killing it. This insect, though sucking the juices of the tree and leaves, does not seem to kill the trees outright to the extent that the San Jose Scale does. It seems to attack only the outer twigs, leaving the larger limbs free, and therefore, does not kill the tree; but the injury is due to the fact that the scale insect secretes a honey dew, which gives rise to a dark fungus that lives on the honey dew, and affects the fruit. This fungus spreads all over the fruit on the tree, making it dark, unpresentable, and unsalable, and the loss has been due to the fact that the fungus scarred the fruit, so as to make it unsalable at the proper prices. So, it is a question of considerable importance, and the spread of it this year leads us to believe that we have certainly got to get after it; and the question is, how should we get after it. In our tests with the Lime Sulphur and the miscible oils in 1907, we secured fairly good results. Thinking that the Lime Sulphur would be sufficient, and that the orchards that had been sprayed with Lime Sulphur for the San Jose would be protected, we felt secure. We found, however, that the Lime Sulphur made no difference. It spread through the whole orchard. We are up against it as to what to do at the present time. There are several other parties around Smithsburg that have it more or less, but not to the extent of the orchards referred to.

This insect winters as an immature female. Early in the spring it begins to grow, and reaches maturity about the first of May. Later it begins laying eggs, and itself dries up, like the oyster shell scale. The eggs hatch out about the first of June. The young ones crawl out. Instead of inserting their beaks on the limbs, as does the San Jose, these insects go out on the leaves, up and down the ribs on the under side of the leaves. If you examine the peach trees the first of June, you will find a soft, flat little scale out on the under side of the leaves, up and down the mid rib. They stay there six weeks, secreting their honey dew, and the fungus drops down and gets all over the peaches. In about six weeks they return from the leaves to the twigs, and remain there, developing over winter as an immature female. This scale is unique in its habits, in that it infests both the twigs and the foliage. We had thought that spraying the trees just as the eggs are hatched, or when they are going out on the leaves, with kerosene emulsion, would kill them; but this did not prove to be the case. The emulsion should be applied just as the eggs are hatched. I cannot at this moment give you any advice as to the controlling of this pest; but experiments are under way, and we do know that so far the oils seem to be effective. I was in an orchard about the 10th of December, where the oils had been applied a week previous, and quite a number of the scale had been killed.

Member. Do they infest the apple?

Prof. Symons. They do not infest the apple.

Prof. Symons. You had better look over your orchards and see if you can find the Lecanium; and if you find it, you had better spray with oil now, because the fact of losing a crop of fruit would be nothing in comparison with having that scale spread in your orchard. I would suggest now, the use of the oils 1 to 15 for this scale; and if you find this Lecanium, I would use the oil right now, —the sooner, the better.

Mr. Newcomer. What color is the fruit of an infested tree?

Prof. Symons. The fruit looks just as if you had taken soot out of the chimney and thrown on them.

Mr. Newcomer. Some of the leaves, also?

Prof. Symons. Yes. And the fruit has this fungus all over it.

Member. What would be the effect of self-boiled Lime and Sulphur as a fungicide for that condition?

Prof. Symons. We have not had the experience. It would probably help it.

Member. Have you any points on it?

Prof. Symons. Well, no sir; I would not express an opinion; but my advice would be to consult the pathologists and Mr. Fulton, of Sleepy Creek, as I understand he had fine results the past season.

Prof. Whetzel. Did you say you used the Niagara Brand in some of your experiments?

Prof. Symons. Yes.

Prof. Whetzel. Did you use it with sediment in it, or clear?

Prof. Symons. I think it was the clear grade.

Prof. Whetzel. In your opinion, what substance in the Lime Sulphur is effective in killing the scale?

Prof. Symons. I would appreciate it if you would ask me something easier. I do not believe anybody in the world knows. The real chemical action that take splace on a tree after poly-sulphides are applied, is a mystery. So far as I know, the scale is killed by the caustic effect of the solution. Oxydizing takes place, giving forth free sulphur and several other combinations; but as I say, I do not know. It is a very nice problem to work out.

Mr. Baugher. Would there be any advantage in using the prepared Lime Sulphur one to five?

Prof. Symons. I would consider that a little too strong. It would not hurt the apples; but it is going to the extreme; one to seven or eight would be the strongest I would care to use.

Finally, as to the Peach Lecanium, I simply offer this to the growers. I urge them to look into their orchards for the pest, and suggest that oil is the possible remedy. If we cannot control scale by Lime Sulphur, we must conduct some experiments with oils. We shall have to try them in the fall; if they do not have the desired effect then, we shall have to try them in the spring. We may have to use whale oil soap, which cannot be applied in the fall, while in the spring, just about the time the bud comes into leaf, it can be used with satisfaction.

Codling Moth.

In regard to spraying for codling moth, I have here a number of photographs, prepared for use at the Maryland Horticultural Society Meeting, which I shall be glad to have you examine. The figures illustrate the work of our department during the past season, along the same lines as the work done by Professor Surface in Pennysivania.

The best means of disseminating information is to show the people the results to be obtained. Our policy is to conduct the experiments on the poor house farms of the counties. Being public property nothing can be said against any money expended by the State on these farms. The people of the county can go to these farms, and see up-to-date methods applied.

This (shows picture) illustrates the benefit of one spraying on apple trees with Bordeaux Mixture and Paris Green. I was able only to make one spraying, on account of the conditions; and it indicates what can be accomplished by simply one spraying.

As you all know, the Codling Moth is an insect that does its injury by eating into the apple and making the fruit wormy. You cannot sell wormy fruit; you want to grow perfect fruit, and get good money for it. We can easily control this pest.

W. C. Tyson. Do you prefer Paris Green to Arsenate of Lead?

Prof. Symons. I have a very high opinion of Arsenate of Lead; and in our experiments have secured slightly better results after using Arsenate of Lead then when Paris Green was used (See Fig. 7 and 8); but with Bordeaux Mixture there is not the difference. In these experiments I have used Paris Green; it is considerably cheaper.

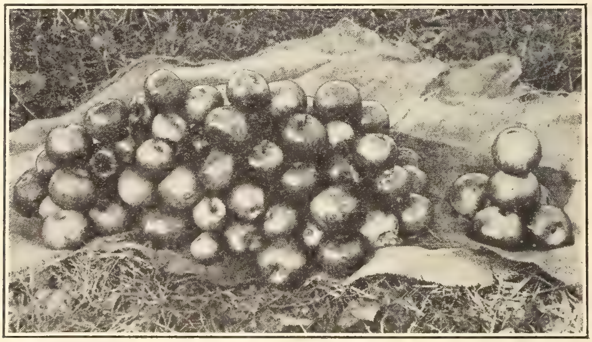


Fig. 7. Apples from Unsprayed Trees. Large Pile, Culls. Small Pile on the Right, Saleable Fruit. (Photo by Peairs.)

W. C. Tyson. Does it stick as well?

Prof. Symons. It does not; but when applied with Bordeaux, you have the Bordeaux to make it stick.

W. C. Tyson. Is there any danger of burning?

Prof. Symons. No, sir; not with the Bordeaux Mixture.

Member. What per cent of Paris Green do you use with the Bordeaux Mixture?

Prof. Symons. One-third of a pound to 50 gallons.

Member. What formula of Bordeaux?

Prof. Symons. I think it was 4-4-50 or 4-5-50.

Member. Have you used "Pyrox"?

Prof. Symons.—No, sir.

Member. Did you make your own Bordeaux Mixture?

Prof. Symons. Yes, sir; we made our Bordeaux Mixture. I have shown you what we secured from one spraying. I urge that every one of you who is trying to become an orchardist, consider the fact that you have got to raise good fruit, and that you cannot raise it without controlling the Codling Moth. I would therefore urge one spraying, and preferably two sprayings.

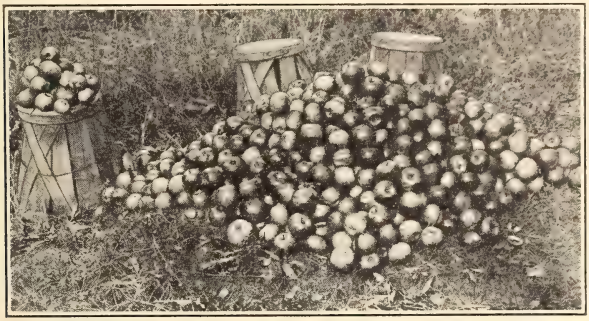


Fig. 8. Sprayed Once with Arsenate of Lead and Bordeaux Mixture. Large Pile not Wormy (Saleable), Small Pile Wormy.
(Photo by Peairs.)

Member. When do you spray the second time?

Prof. Symons. Two weeks after the first. Spray just after the blossoms have fallen, and then ten days later.

Member. Is that late enough to catch that second brood?

Prof. Symons. No; the second brood does not appear until July; a third spraying is necessary to control this, but is more likely to russet the fruit at that time. The second spraying is important, however, to take care of the late-appearing moths from first brood.

Member. The first spraying would not take care of the later-emerging moths?

Prof. Symons. No, sir; except that it would reduce the number of moths for a subsequent generation.

Mr. Dunlap. Is there any chance of catching the moth?

Prof. Symons. No, sir; it is very tiny.

Mr. Dunlap. Are not bands sometimes used to catch the moths?

Prof. Symons. Yes; that is one means of catching them. If you have not sprayed thoroughly, reaching every calyx, the banding is of value in catching the escaped larvæ. These larvæ emerge from the calyx, crawl down the tree, and enter any available crevice. If you have a band around a large limb, or around the trunk, usually the larvæ will go in under this band, and can thus be readily captured and destroyed, thus preventing a second generation. We have sometimes in this way captured thousands of them. There is a fungus that works on them. If you spray thoroughly there should not be over five or six per cent of the moths for a second generation.

Member. If you spray thoroughly, and spray only once; is that sufficient; or do you advocate second and third spraying?

Prof. Symons. I believe in being just as practical as possible. If I were in the orchard business I would spray more times than that; if I were a farmer, and found that other duties would not permit more than one spraying, I would insist only upon one spraying.

In closing, I urge that we all try to raise better fruit. "Better fruit makes better men; better men make better communities; better communities better their environments; better environments demand better roads; better roads make better counties; better counties demand better schools; better schools make better children; and better children will make a better state."

The Chairman: We are glad to welcome into membership any fruit growers, whether resident of this county or not. If any who desire to join, will give their names to some member of the association, they will be presented at the opening of the next session.

President Eldon. I want to say that a hearty welcome will be extended to anyone who desires to become a member of our association. I know you have all been welcomed here, individually and collectively; but I want to add my say-so; you know, being up here, I am in position to say the last word, and that counts for a great deal. I want to extend my welcome to you all, and a cordial welcome to anyone who wishes to meet with us. We certainly appreciate the intentions of those who, while comparative strangers, join us. It is a very high compliment. We want to feel that we are progressing somewhat year by year; and the only way we can do this is to interest those who are in our own business. The presence of you here shows that you are interested; and we thank you for your coming. If you are members of our association, we feel sure you will stay, being a unit. And thus we grow year by year.

PRACTICAL PRINCIPLES FOR PROFITABLE PEACH PRODUCTION.

CHARLES E. BASSETT, *Fennville, Michigan.*

Being a commercial peach grower in the Michigan fruit belt, I shall only attempt to give you briefly the common principles and practices of the leading growers of our section. We attempt no fancy methods—every dollar expended and every hour's work devoted to the business is looked upon as an investment. With most of us, peach production is a "bread and butter" affair. Your own experience with local conditions will enable you to judge just how far our methods can be followed successfully in your several orchards.

Soil and Location.

While a good loam is our ideal soil, we have good orchards on nearly all kinds of soil. We do demand, however, that all peach lands shall be well drained, both as to air and water, and, as moderate elevations tend to furnish both a good air circulation and water drainage, high or elevated lands are preferred.

Preparation of Soil.

The ground to receive our baby trees must be well stocked in advance with suitable food to give them a vigorous start. Plowing under clover or other nitrogenous crops, before setting the trees, furnishes humus, which is especially valuable in making the ground spongy—capable of holding large quantities of water.

Varieties.

The choice of varieties is largely a local matter. Select those which do best in your locality and which supply the demands of your market. The large plantings of peach in Georgia, Texas, etc., have caused us to discard the early varieties, especially the clings. In our section the best commercial orchards include such kinds as the Yellow St. John, Engle's Mammoth, Conklin, Fitzgerald, Elberta, Kalamazoo, New Prolific, Smock and Salway—all yellow varieties. The Champion is one of the leading white kinds, but our market calls for large, high colored, yellow peaches. Such kinds as the Barnard, Crosby and Gold Drop are excellent in quality, but are too small, under ordinary cultivation, to be wanted by our buyers. Despite its poor quality, the size color and shipping ability of the Elberta makes it the leading market peach.

Cultivation.

Our main object being quick and large cash returns, we do our utmost to force a strong, sound growth from the start by intensive cultivation EARLY in the season. Corn has been commonly grown the first two seasons between the trees, it being thought that the loss of fertility occasioned by the feeding of the corn being partly balanced by the corn's shade to the trees from the scalding rays of the sun. Later and better practice seems to omit all crops and give all the land to the peach trees. The trees are headed low—not over 18 inches from the ground—and this calls for special tools in cultivating. The extension disc harrow and the extension fine tooth drag are some of the best tools after the second year, when the trees are given the whole of the ground. Cultivation must be kept up each week to save soil moisture and make more plant food available, by bringing the small particles of soil in contact with the air.

Pruning and Thinning.

Just as a fond parent corrects in his infant child any faults that may appear, so the true lover of trees, from the very first season, rubs off any buds that appear where a limb or twig is not desired, and he thus forms a correct head. A common mistake is to leave the forming of the head of the tree until it is three or four years old, when good-sized limbs must be cut off, leaving large scars that are hard to heal and which often leave a weakness. Allowing unnecessary limbs to grow is also a great waste of plant energy. In fact, our former methods of horticulture seem to have been based upon the principles of forestry rather than upon those of fruit production. The engineer who would attempt to run a ten horse-power engine with a five horse-power boiler would be no more lacking in judgment than is the fruit grower who permits his tree to over-balance the root system that is called upon to sustain it. Build up that root system by continuous and intelligent feeding and then restrict the labor of the tree by severe and annual pruning and thinning. Prune so as to open the tops, so that God's free sunshine may reach all of the fruit and so paint upon their cheeks those beautiful colors, which are so eagerly sought after by the purchasers of our products. We prune our bearing orchards during the dormant period, preferably in March, after the hardest freezes are over. Many get good results by spring or even summer pruning, and one of the most profitable orchards I have ever seen has always been pruned in the fall. However, I am inclined to attribute the fine results in the latter case to the severity of the pruning, rather than to the time when it was done. Much of the thinning can be done by severe pruning, but even after that has been done the expense of picking off the surplus peaches by hand will often be considerable. This thinning is essential and must be done before the pit hardens. The production of seed is a most exhaustive process and the trees must be given all possible relief by reducing the number of fruits. Stronger and longer lived trees, larger sized fruits and doubled profits will thereby result.

Diseases and Insects.

Curl leaf develops during cool, moist weather, but a thorough spraying of the dormant trees in March with a solution of two pounds of copper sulphate (blue vitriol) to fifty gallons of water is a sure preventive. Since we have been using Lime Sulphur to destroy the San Jose scale on our trees, we find that it is equally as effective in controlling the leaf curl. "Yellows" and "Little Peach" are deadly diseases of unknown origin. There is no known cure and the only safe course is to cut down and destroy by fire all diseased trees as soon as discovered. These diseases can only in that way be held in check, but "experimenting" with these diseases has cost many a grower his entire orchard. The annual "grubbing" of the base of the trees, to destroy the borer, is also necessary—sometimes twice in the season. Many a sick looking peach tree will upon examination be found to be nearly girdled by the peach borer, whose work can be discovered by the gummy substance that exudes from the injured roots. Mounding the earth up around the base of the tree and then removing the earth after the period of egg laying has passed, is a method of some value and many report good results from applying gas tar to the base of the tree, thus shutting out the borer. The plum curculio is often quite destructive to the peach, but clean cultivation will generally destroy the pupa.

Fertilizers.

Stable manure is all right to secure rapid wood growth, but it continued use in large quantities produces wood that is soft and tender—easily injured by the cold winters. However, in our exclusive fruit section, we do not have enough stable manure on our farms to make it possible for us to do much of this kind of "damage." Fertilizers that are rich in potash and phosphoric acid are most valuable, such as unleached hardwood ashes and ground bone. We find great profit from the use of commercial fertilizers, the foundation of which is usually muriate of potash and ground bone from the packing houses.

Cover Crops.

About the middle or last of August we sow some cover crop in the orchards. Oats and barley have been very good, but the sand vetch is now most popular, as it makes a mammoth growth and also adds considerable nitrogen to the soil, it belonging to the class of legumes. When it first begins to grow, this cover crop acts as a "robber" crop —taking up the soil moisture and available fertility at a time when we want the trees to stop growing and to ripen their new wood. Later this cover crop acts as a blanket, to hold the leaves and snow, preventing bare spots on exposed knolls and the consequent deep freezing and root injury. In the spring this cover crop furnishes considerable humus to be turned under and thus improve the mechanical condition of the soil. Clovers would be even better for this purpose, as they furnish considerable plant food, but they have to be left too late in the spring if they get much growth, and they are then robbing the trees of food and moisture at the time when the trees should be making their best growth. We also find it difficult to get a catch of clover under large bearing trees.

Finally, adopt the most intensive methods, to produce the largest and handsomest specimens, pick and pack them carefully and as near ripe as your market will permit; pack honestly, so that you can guarantee every package; market through some co-operative system that will eliminate as many middle men as possible and, above all things, be "in love with your job" and "Johnny on the spot," and you will be safe in looking for a neat balance on the right side of the ledger at the end of each season.

Member. Kindly give symptoms of the Peach Yellows.

Mr. Bassett. Yellows is a disease that generally makes its appearance by a fine yellow growth; the fruit itself becomes mottled on the outside, and when it is broken open, shows red streaks running to the pit.

Member. How do you work the Vetch in?

Mr. Bassett. Cut it up with a disk and plow it under.

Member. It is pretty hard, is it not, to plow in an orchard of three years' growth?

Mr. Bassett. Yes; but on sandy soil, with a good disc harrow, you can chop it up pretty fine and turn under. There are two or three kinds of extension tools that might be used for this purpose,— or, you might get a grape hoe.

Member. What does a grape hoe cost?

Mr. Bassett. Mine cost $18 or $19.

Member. Where do you buy them?

Mr. Bassett. I bought mine in Syracuse; I do not know where you can buy them.

Member. They make them at Northeast.

E. C. Tyson. Mr. Hiester uses the Grape Hoe.

Member. Is it a small plow?

Mr. Bassett. No; it has a little cultivator attachment. It simply slides along. The Disc is on the handle part, so it can wind in and out. One horse draws it along. With it you can get around close to the tree, and plow the soil.

Member. Did you ever use the Acme?

Mr. Bassett. No, sir; I do not like it as well as the full Disc.

Member. I would like to ask Mr. Bassett how much he would cut back the peach tree at the first year's growth.

Mr. Bassett. Well, sir; we watch our young trees, and when the buds begin to start, we select four buds, being careful to not get them together,—four buds that will eventually become the head of the tree,—and rub off the rest. These four buds are watched. If one is destroyed, we can find another, and produce a limb in its place. That new growth is the next year cut off about one-half. That will strengthen the tree and give it form and size. It is a great deal easier to rub the buds off with the fingers than it is to go out and saw them off when they have become limbs. You will find, however, that where a bud is rubbed off, its place will be taken by others, tending to produce a brushy section. You must be careful, and continue to rub these off, keeping the growth in subjection. What we want to remember is, that in bearing wood, we want root system, not a big top. Most growers seem anxious to get a big top—a forest tree,—when in reality he should aim to get a big root system.

Member. I think, if our friend will take a branch and cut it off at the crotch, he will never have another single sprouting.

Member. What are the first symptoms of the Little Peach?

Mr. Bassett. It resembles the yellows. It does not have so much wiry growth. At a distance the tree looks as if it is dying; it makes new growth out on the limbs. With the yellows the growth would be from the trunk. There is less wiry growth from the trunk in the Little Peach. The fruit remains small and is delayed in ripening.

Member. How many years do you continue cutting back one-half?

Mr. Bassett. Until the tree comes into bearing; and then watch the tree, and if it makes more growth than you want, do more cutting. Have an idea how you want the tree to be, and cut according to the amount of growth the tree makes, and according to the amount of food received.

Member. Do you spray for Black Rot?

Mr. Bassett. Yes, sir; we sprayed this year with Lime Sulphur, and had pretty good results. We used a very weak solution; we were afraid of burning the foliage. Our Elbertas are quite inclined to having the rot, and we succeeded in cleaning it out pretty nicely.

Member. What kind of Lime Sulphur did you use?

Mr. Bassett. Commercial—manufactured by one of the companies—Grasselli. We also used the self-slaked. The trouble in this self-slaked, or self-boiled, made by simply slaking the lime and the sulphur coming into combination with it, but not in chemical combination,—is that the slaking is often allowed to progress too far, forming a chemical combination of the lime and sulphur, which will burn the foliage. To avoid such a combination, you must be careful to halt the slaking before chemical action is reached, by the addition of cold water.

Chester J. Tyson. Mr. President: I move that the chair be authorized to extend the unanimous thanks of the Association to the gentlemen who have met with us as instructors. (Carried.)

Mr. Eldon. It is my pleasure to extend to you the sincere thanks of the Association for the valued service you have rendered during this convention. I regret that I was not able to be here until to-day. I appreciate all I have heard. As Mr. Tyson has said, we cannot say all we feel in this matter. It is something that is too deep for words. I can simply say, for myself, and for the organization, that we have been very much helped. I hope that you will accept in that spirit, and that you will come again to assist and help us.

E. C. Tyson. Mr. President: There are two bills which will claim the attention of Congress this winter that should interest us very much. One is the National Pure Insecticide Law, the object of which is to prevent the manufacture, sale or transportation of adulterated or misbranded Paris Greens, Lead Arsenates, and other insecticides, and also fungicides, and for regulating traffic therein, and for other purposes.

This measure resembles the Pure Food and Drug Act, making it a misdemeanor, punishable by fine, to transport impure insecticides over State lines. It of course has no effect on intra-state affairs, its object being entirely the protection of inter-state commerce.

The matter was taken up last winter and threshed over to some extent, but nothing definite accomplished. It is hoped that at this session of Congress final and favorable action will be taken. I would like to ask Mr. Bassett if he is familiar with the provisions of this bill.

Mr. Bassett. I believe I am one of the members of the committee. I did not draft the bill; I was simply invited, as a member of the Michigan State Horticulture Association, to become a member of the Board. The agricultural chemists, the manufacturers of these goods, and our horticultural and experiment stations organized to co-operate in getting pure insecticides of known value, and to prevent the manufacture of Arsenate of Lead below 12½ per cent Arsenic Oxide.

The intent of the bill is to standardize our insecticides, so that no one shall have the right to manufacture and sell a poison,—an Arsenate of Lead, a London Purple, or Paris Green, not up to a certain standard. It is not an unattainably high standard, but a standard all can meet. It is to show up the fellows who are trying to put upon the market articles of poor quality, and corresponds in its nature to the Pure Food Laws of the different States. It works on the principle that a man in buying a thing, is entitled to the thing he buys. Just as with Fertilizer. A man must first be able to guarantee a certain amount of essential elements, and this percentage of essential elements must be printed on the outside. In our State, before a man can sell Arsenate of Lead, London Purple, or Paris Green, he must first have those goods analyzed by an agricultural station. He must record what he claims is in that article. And if he fails to come up to the requirements, he is subject to a fine. The bill was brought into being perhaps to protect the average unfortunate fruit grower from being swindled by some adventurer. It is certainly worthy of your support. A similar motion has been adopted by our State Association and by our local society; and we are anxious to push it. It is supported by the manufacturers themselves, by the agricultural chemists, by the experiment stations, and all the agricultural stations. There is a lobby against it, and the very fellows who are lobbying against it, are the very ones it is intended to reach.

E. C. Tyson. Mr. Chairman: I am very glad to know that Michigan has taken up the matter of protection *within* the State. This National law will protect us against adulterated spray material being shipped to us from other States. If we can accomplish this, we shall be in line to have a similar law adopted by our own State Legislature for protection against manufacturers *within* the State. I therefore move, Mr. Chairman, that this Association go on record as being in favor of this bill; and that everything possible be done to encourage its passage.

Member. I move to amend the motion by instructing that our corresponding secretary inform the proper persons of our action. (Adopted.)

I would like to ask Mr. Bassett if he is acquainted with the proposed National Legislation for the inspection of nursery stock shipped into this country.

Mr. Bassett. I am not acquainted with the details of that bill. I know that it is a good measure, because backed by the men who have the work in charge. It is a proper measure; we supported it.

E. C. Tyson. Professor Symons called my attention to this matter this morning. He said it was necessary for the State of Maryland to examine over a million specimens that came into the port of Baltimore in the year just past, thus making it necessary for Maryland to bear the expense of the inspection of nursery stock that was going through Maryland for other States. I do not remember his figures; but they found considerable quantities of Brown Tail Moth in these importations. I understand that Mr. Engle, our Nursery Inspector, and his assistant, spent several months in Philadelphia during this past season on that work. Some of that was intended for distribution through this State, of course, but some of it passed into other States. It is not proper for Pennsylvania to bear all the expense of that examination. All who have been reading the fruit papers this summer know what excitement was created through the importation of infected apple seedlings, which were distributed through parts of this State and New York. Fortunately the inspectors were able to follow it up, and quantities of the Brown Tail Moth were found and destroyed. It is a serious question. The New England States can tell us what it means. They are spending hundreds of thousands of dollars every year, and are as yet unable to control the pest. The National Government should establish quarantine against nursery stock coming from across the water ,accompanied by sufficient examination before it is distributed in this country, to guard against dissemination of this and other pests.

Professor Symons was not sure of this matter being before Congress. It will probably come up during this present session. I think it is a very important matter. I would like to see our Association register its views on the subject, and to do what is possible to encourage the adoption of this regulation.

Upon motion it was unanimously agreed that the Association support this measure.

E. C. Tyson. I would like to ask Mr. Bassett if he was in attendance at the International Apple Growers' meeting at Buffalo; and what action was taken in regard to the Lafean Bill—what changes were made?

Mr. Bassett. I cannot do it; I got tired and left. They argued both for and against it. Eventually they made some changes, which were adopted. The Middle States fought it on account of the package; the Western States, like Missouri, even the Hood River Valley, fought it because they did not like to be dictated to in regard to the size and shape of package.

E. C. Tyson. Many of the western growers have received the impression that they will be restricted to a certain shaped box, while it is simply a matter of capacity. The western growers insist that the balance of the United States accept the Winchester bushel as a bushel of apples. As you know, it is customary throughout this part of the United States, and at least as far west as the Mississippi, to heap the measure generously. The western growers pack their fruit in a box and send it East, to be sold on our markets as a bushel of apples, in competition with our heaped measure, which averages about 200 cubic inches more. It is my opinion that we should try to have added to this bill, the requirement that every man who packs a barrel of apples for inter-state or foreign shipment, be required to place his name and address on the head of the barrel. This provision is a part of the present bill in so far as the grower elects to take advantage of the privilege of marking the fruit "standard." If he decides not to take advantage of that privilege, there is no part of the law that touches him. If you require a man to place his name and address on the head of the package, he is going to stop and think a good deal before he puts bad stuff on the inside of it; and it occurs to me that just that one point will do more to correct the bad packing that has become so prevalent all over the East in the last few years, than anything else.

Chairman. Do you wish to take any action in the matter?

C. J. Tyson. Mr. President: I move that this Association go on record as being in favor of the bill as now proposed; and that our continued support be given to it; and if the committee representing the various organizations having the matter in charge, consider it necessary at any time during the winter that representatives of this association go to Washington to assist in the support of the bill, that they be sent at the expense of this association. (Motion was seconded and carried.)

Mr. Bassett. I desire to express my appreciation of the kindness shown me while here. I came here prepared to have a good time and to meet good people. Mr. Hiester said this was one of the garden spots of the earth, and I believe Mr. Hiester spoke the truth. I knew I was going to have a good time, and I was not disappointed. Though I know Michigan is a long ways off, if any of you ever come to Michigan, I shall try to make it as pleasant for you as possible. We have a good State Association, and are proud of our country; and you should be proud of yours. I was richly repaid for my trip, and shall carry pleasant recollections with me.

The Fruit Committee will now make their report. Will call on Mr. Anderson.

REPORT OF FRUIT COMMITTEE.

Mr. Charles E. Bassett, Secretary of the Michigan State Horticultural Association.

Mr. Albert T. Repp, President New Jersey Horticultural Association.

Joseph W. Anderson, Orchardist, and Director of the York County Agricultural Association.

Mr. Anderson, on behalf of the Committee, made the following report:

I want to say, Mr. Chairman, that I believe this is the first time I was appointed on a committee when the chairman of the committee declined to make the report. I believe they went down gently from the top of the list to the bottom of it, and I came right in at the bottom of the list. The chairman has placed me in a position that he observed himself was a critical and difficult one to get through with without offending a New York man, an Oregon man, or some other man; but then, I am safe, I believe; I am near the Mason and Dixon line, and if I should make any statement that offends, I can just steal down across the line into Maryland, and avoid all further difficulties.

Almost anyone, I think, would be better able to make this report than I; but then, in order to get you to accept my report, I suppose I must say that I do know some little about such things, having been connected with the York County Agricultural Association, as Director, for a number of years. York County has always claimed to have the best fruit in the State. Yes, York has good fruit, I must say; but when it comes to butting up against anything like this, York County simply cannot do it. It is safe for me to say this, as I am a little way from York. I hope no one will carry this back; but I honestly think we are completely beaten. As you know no premiums are offered. I should have been glad to have gone over the whole display and pass judgment on the best fruit. The only thing we can do is to make a general report and give premiums to all. I have no report written out. I tried to think of something during the night; I did succeed in getting some thoughts together; but I have by this time forgotten more than half of them. Out in the West they talk of their beautiful sunsets, just as if they could see the sunsets out there better than we. Now, while it is perfectly natural and right for us to see our own possessions in a rosy light, yet I certainly wished I had my old goose quill pen with which I used to write in days gone by, so that I could pen some fitting tribute to this beautiful fruit display of Adams County.

Some of the apples I see here are just as good as the Hood River Valley apples,—the kind I often take home with me to show the folks the kind they raise out in the Hood River Valley and the West; the kind for which I often pay 25 cents when I get three apples.

If I were away from here and anyone brought some of these apples to me for apples from that section of the West, I should not know the difference. I certainly congratulate you people on your great success in growing fruit. I do not think I will extend my report any farther than this. I thank you all very much for your attention, and if the report is satisfactory, hope you will accept it.

Chester J. Tyson. I move that the report of the Fruit Committee be accepted, and that a vote of thanks be extended these gentlemen for their services. (Unanimously carried.)

Chester J. Tyson. I did hope that the committee would go a little further into the matter, and criticise the manner of display. We have been trying to get up an exhibit from the County for our State meeting. We have been successful in coming off with awards so far. We understand that we are to come up against more severe competition from time to time. The thing we want to know is, whether the plan we have adopted is the best way to display our fruit to advantage. If the committee could tell us anything about this, we should be glad to hear it.

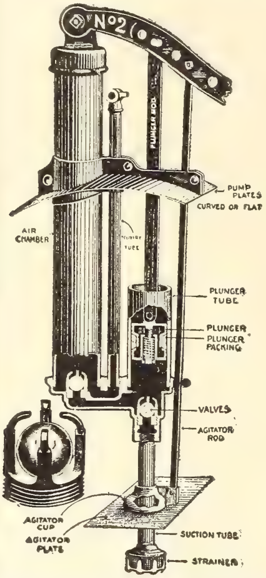
Mr. Anderson. If you had a large hall, and could have this fruit on lower platforms, and people pass around them, it would be very interesting and instructive; but as you have no larger hall, I do not see how you could have done any better than you have. As the community becomes more wealthy, as I have no doubt you soon will, you can have a larger hall, and arrange your fruit in the way suggested.

Member. We shall be pleased to hear from other members of the Committee, if they choose to make any remarks in this regard.

Mr. Bassett. I will say, Mr. Chairman, in the matter of displaying fruit, it depends quite a little whether you are appealing to scientific judges or to the people who are passing by, and the general effect on their minds. If you are appealing to competent judges, it is important that the fruit be perfectly sound. They care little whether the fruit be arranged in stars or crescents; they want to known absolutely that the fruit is perfectly free from all imperfections. Your arrangement would be perfectly satisfactory.

The one thing I do want to criticise, however, is the absence of the stems of some of the fruits—a thing that may appear very small to you; but when you come to apply to the professional judge, if you have lost the stem, he will give you a docking on that. The stem is a part of the apple; and though we do not eat the stem, it is

MR. LEIGH, Superintendent, put on the N. Y. C. Stock Yards, Buffalo, N. Y., 40 tons (80,000 lbs.) of Cold Water Paint with these . . . . . .



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Kills All Leaf-Eating Insects
Sticks to the Leaves And Will Not Burn
Improved Methods Increase Profits

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a valuable point of identification. The stem is often the means of telling conclusively the variety that is presented.

Another thing I want to criticise in your exhibit. In your selection of five apples—which should be a plate—you should be very careful to have the apples all of one size, all of one color—true to type—not overgrown. I believe there is a type for every variety; and that where an apple is of the ordinary size—good, fair, ordinary size, of good high color, perfect in all respects, it is always given the preference to apples overgrown and not true to type. We are not exhibiting monstrosities, but specimens of what we expect to produce in our orchards.

In a contest recently opened by a spray pump company, which offered a spray outfit as a premium for the best plate of Northern Spies, the outfit was awarded to a young man who had been in business only three years, simply because he went to the trouble of finding out what in their mind constituted a perfect plate of apples. The first thing that was done when the contest opened, was to eliminate from the twenty-six plates exhibited, twenty plates of monstrosities, devoting their entire attention to six plates of good, fair-sized apples, true to type.

Detailed Report of Fruit Exhibit.

We find in this exhibit, 214 plates, as follows:

Robert Garrettson, 6 plates—
- 3 Plates York Imperial.
- 1 Plate Langford Seedling.
- 2 Plates Smith Cider.

Curtis Peters, 10 plates—
- 4 Plates Winter Paradise.
- 6 Plates York Imperial.

H. G. Baugher,
- 1 Plate Purple Top Globe Turnips of immense size, yielded this year at the rate of 400 bushels per acre.

D. G. Minter, 5 plates—
- 1 Plate Coal.
- 1 Plate York Imperial.
- 2 Plates York Stripe.
- 1 Plate Jonathan.

A uniformly good exhibit.

C. E. Jones, Kearneysville, Va.
- 1 Plate Mammoth Black Twig.

H. M. Keller,
- 2 Plates Winter Banana.

Very fine fruit, attracted considerable attention.

Rufus Lawver, 10 plates—
- 2 Plates Paragon (highly colored).
- 2 Plates Wine Sap.
- 1 Plate New Centennial.
- 2 Plates Gano.
- 2 Plates Seedlings (attractive red fruit, of medium size).
- 1 Plate well-colored fruit, resembling King (said to result from top-working Summer Rambo on natural stock).

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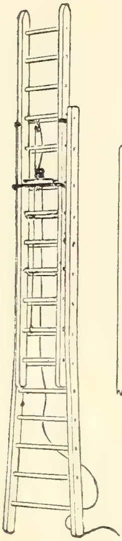

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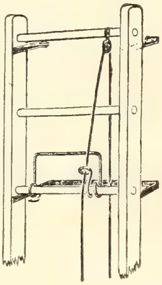

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Special two-section Sectional Ladders for fruit picking. Trestles, swing stage ladders, ladder brackets, ladder hooks, window jacks, extension plank, etc.

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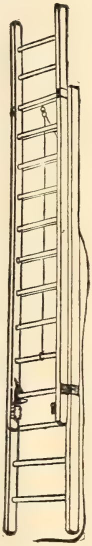

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M'f'g. of Apple Barrels and Staves a Specialty
PRICES LOW

MILLWORK of all Description, and Lumber of all kinds

Call, Phone or Write—United Phone

C. E. Raffensperger, 5 plates—
- 4 Plates York Imperial.
- 1 Plate Grime's Golden.

All good specimens.

E. P. Garrettson, 31 plates—
- 14 Plates York Imperial.
- 1 Plate Balsley.
- 1 Plate Summer Rambo.
- 2 Plates Domine.
- 1 Plate Fallawater.
- 1 Plate Romanite.
- 2 Plates Smith Cider.
- 2 Plates Cayuga Red Streak.
- 2 Plates Baldwin.
- 5 Plates York County Cheese.

A large, interesting exhibit.

Mrs. W. S. Morrison, 4 plates—
- 1 Plate Belmont.
- 1 Plate Fallawater.
- 2 Plates Wagner.

Tyson Brothers, 14 plates—
- 2 Plates Rhode Island Greenings.
- 2 Plates Stayman.
- 2 Plates York Stripe.
- 1 Plate Wagner.
- 7 Plates York Imperial.

The color of the Stayman in this exhibit indicates that we need not fear on that score.

C. A. Griest, 11 plates—
- 3 Plates Grime's Golden.
- 2 Plates York Imperial.
- 2 Plates Baldwin.
- 3 Plates York Stripe.
- 1 Plate medium sized red fruit, for a name.

R. M. Eldon, 16 plates—
- 5 Plates Ben Davis.
- 3 Plates Baldwin.
- 2 Plates Summer Rambo.
- 2 Plates Smith Cider.
- 2 Plates Grime's Golden.
- 2 Plates Dickinson.

A clean, uniform, well-selected lot of fruit of high color, the Baldwin and Summer Rambo being wo thy of special mention.

L. C. Hall, Avonia, Erie Co., Pa.—
- 1 Plate Erie County grown English Walnuts.

Kernels were found to be large, well-developed, and of fine flavor.

Oscar Rice, 7 plates—
- 2 Plates York Imperial.
- 3 Plates Jonathan (highly colored).
- 1 Plate Baldwin (very large).
- 1 Plate Smokehouse.

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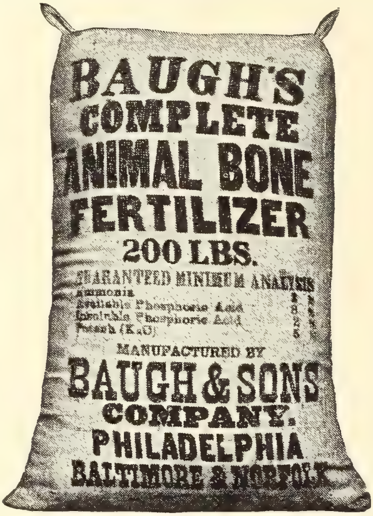

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BAUGH'S Raw Bone Manures have uninterruptedly held their prestige. The sales throughout the United States have been enlarging and extending year after year until they now amount to ONE HUNDRED THOUSAND TONS ANNUALLY. Their excellence is acknowledged wherever they are employed. To-day they head the list. Although the oldest brands, yet they are ever the newest or most advanced products in scientific and mechanical perfection.

APPLICATIONS of make-do fertilizers, whose cheap ingredients are exclusively derived from mineral, vegetable, refuse and other low grade sources, have often been attended with failure. Never under similar favorable conditions have the results from Baugh's Raw Bone Manures been disappointing. While satisfactory immediate results from the use of any fertilizer cannot be guaranteed, yet consumers can with confidence rely on sooner or later getting paying returns from Animal Bone Manures. DEALERS WANTED IN UNASSIGNED TERRITORY.

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Baugh's 1910 Almanac just out. Ask your dealer for it or write us.

Anthony Deardorff, 6 plates—

1 Plate Ben Davis.
1 Plate York Imperial.
1 Plate Smith Cider.
1 Plate Red Doctor.
1 Plate York Stripe.
1 Plate Willow Twig.

Every specimen perfect and well-colored.

B. F. Wilson, 34 plates—

11 Plates York Imperial.
2 Plates Rawl's Janet.
2 Plates Mann.
4 Plates Baldwin.
2 Plates Winter Paradise.
1 Plate Domine.
1 Plate Fallawater.
2 Plates English Red Streak.
4 Plates Smokehouse.
4 Plates Jonathan.
1 Plate medium-sized fruit, for name.

A very fine lot of fruit; Jonathan and Smokehouse specially good. Some stems missing.

George Oyler, 18 plates—

2 Plates Red Doctor.
2 Plates Grime's Golden.
1 Plate Rawl's Janet.
2 Plates Black Twig.
3 Plates York Stripe.
2 Plates York Imperial (very good).
3 Plates Ben Davis.
2 Plates Wine Sap.
1 Plate Joanthan.

Wolfe Brothers,

5 Plates York Imperial.

William S. Adams, 18 plates—

1 Plate Fallawater.
1 Plate Grime's Golden.
1 Plate Red Doctor.
1 Plate Winter Rambo.
1 Plate Baldwin.
1 Plate Wagner.
1 Plate Sutton Beauty (very large).
2 Plates York Imperial.
1 Plate Domine.
2 Plates Peck's Pleasant.
1 Plate York Stripe.
2 Plates Stark.
1 Plate Smokehouse.
1 Plate Hubbardston.
1 Plate, for name (wrongly marked Shackelford).

J. Kerr Sterrett, Oakville, Pa.—

1 Plate Jonathan. Very highly colored.

J. W. Prickett,—

6 Plates Stayman. Very large and well colored.

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Adams County Fruit Records

Shipments Over Gettysburg & Harrisburg R. R.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In Bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gettysburg (G. & H. R. R.)	1905	318	333	651	4	1	......		....
	1906	28	......	28	......	...	......	......	....
	1907	127	.....	127	1	...	$2 25	......	....
	1909	12	.....	12	....	...	......	......	....
Biglerville	1903	8813	987	9800	65	...	......	......	....
	1905	7932	......	7932	53	2	......	....	....
	1906	2785	165	2950	20	...	1 00	$ 70	....
	1907	17164	4216	21380	142	12	2 20	1 50	$ 50
	1908	4956	......	4956	33	6	1 40	75	65
	1909	10785	137	10922	73	1	2 50	1 50	55
Guernsey	1903	2870	2413	5283	35	...	......	......	....
	1905	1771	1166	2937	20	11	.....	......	....
	1906	1414	1329	2743	18	2	......	......	....
	1907	4798	2760	7858	52	15	2 35	1 50	55
	1908	2173	......	2173	15	7	1 50	......	65
	1909	7320	......	7320	49	5	2 50	......	55
Bendersville	1903	4163	......	4163	28	...	......	......	....
	1905	4000	2351	6351	42	16	......	....	....
	1906	1109	1561	2670	18	20	.....	....	....
	1907	2824	6268	9092	61	22	2 25	1 50	50
	1908	2264	.....	2264	15	21	1 40	......	65
	1909	3531	1200	4731	32	15	2 50	1 50	50
Gardners	1903	997	985	1982	13	...	......	......	....
	1905	912	5215	6127	41	4	......	......	...
	1906	.....	....	......	......	...	......	......	....
	1907	6905	5440	12345	82	4	1 75	1 50	50
	1908	433	.....	433	3	1	......	......	....
	1909	2275	4571	6846	46	...	.....	1 35	....
Starners	1905	682	1016	1698	11	5	......	......	....
	1906	664	133	797	5	4	......	......	....
	1907	1572	219	1791	12	3	......	......	....
	1908	487	......	487	3	3	1 50	......	65
	1909	1825	8	1833	12	4	2 50	......	55
Hunters Run (Goodyear)	1903	625	......	625	4	...	......	......	....
	1905	160	160	320	2	8	.....	......	....
	1906	295	262	557	4	5	1 50	75	50
	1907	1417	514	1931	13	12	1 75	85	50
	1908	1704	......	1704	11	1	1 50	......	...
	1909	1289	510	1799	12	1	2 50	......	....
G. & H. R. R. Total	1903	17468	4385	21853	146	...	......	......	....
	1905	15617	9908	25525	170	47	.....	......	....
	1906	6295	3450	9745	65	35	......	......	....
	1907	34797	19217	54014	360	56	.....	.....	....
	1908	12017	......	12017	80	39	1 45	75	65
	1909	27037	6426	33463	223	26	2 50	1 50	55

Gardners—1906, 2 cars pears; 1907, 1 car pears; 1908, 2 cars pears.
Bendersville—1908, 2 cars pears.
Hunters Run—1908, 1 car pears.

G. P. READ

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Apple Barrel Cushions
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Crates
Grape Baskets
Half Barrel Baskets

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Adams County Fruit Records—(*Continued*)

Shipments Over Western Maryland R. R.

	Year	No. Bbls. shipped in Bbls.	No. Bbls. shipped In Bulk	No. Bbls. Total	No. Cars Apples (150 bbls. to car)	No. cars potatoes (500 bus. to car)	Av. price paid per Bbl.	Av. price paid per bbl. for bulk	Av. price paid per bus. potatoes
Fairfield	1905	1215	809	2024	13	3	......	......	....
	1906	300	......	300	2	2	......	......	....
	1907	300	.....	300	2	2	......	......	....
	1908	......	......	.....	......	...	......	......	....
	1909	......	......	......	......	...	......	......	....
Virginia Mills	1907	320	8800	9120	61	...	......	......	....
	1908	......	1620	1620	11	1	......	......	....
	1909	326	1519	1845	12	...	......	......	...
Orrtanna	1903	3300	......	3300	22	...	......	......	....
	1905	1062	......	1062	7	...	......	......	....
	1906	3659	.....	3659	24	...	......	......	....
	1907	3177	2342	5519	37	1	$2 00	$1 50	$ 50
	1908	2686	1020	3706	25	...	......	......	...
	1909	741	840	1581	10	...	2 40	1 50	....
McKnightstown	1903	3438	......	3438	23	...	......	.....	....
	1905	7895	178	8073	54	1	......	.....	....
	1906	2296	254	2550	17	1/6	1 00	1 00	47
	1907	3393	1155	4548	30	3	2 15	1 85	50
	1908	1785	251	2036	13	...	1 75	......	....
	1909	7724	2030	9754	65	1/3	2 50	1 50	....
Seven Stars	1906	28	......	28	......	...	.....	......	...
	1907	63	......	63	.....	...	......	.. ..	....
	1908	42	......	42	......	...	......	......	....
	1909	50	.....	50	.....	...	.....	......	....
Gettysburg (W. M. R. R.)	1606	13	......	13	......	...	......	......	....
	1907	18	......	18	......	..	......	.....	....
	1908	23	.....	23	......	...	......	......	....
	1909	22	......	22	......	...	......	......	....
New Oxford	1907	......	1033	1033	7	...	......	......	....
	1908	.....	......	......	......	...	......	......	....
	1909	......	276	276	2	...	......	......	....
Abbottstown	1907	382	618	1000	7	...	......	.....	....
	1908	......	......	......	......	...	......	......	....
	1909	......	......	.....	......	...	......	......	....
East Berlin	1905	50	......	50	......	...	......	......	....
	1906	1140	1193	2333	15	1/3	1 80	90	70
	1907	49	......	49	......	1/2	2 25	2 25	60
	1908	......	......	......	......	...	......	......	....
	1909	10	205	215	2	...	.....	......	....
W. M. R. R. Total	1903	6738	......	6738	45	...	......	......	...
	1905	10380	1320	11700	78	5	......	......	...
	1906	7447	1447	8894	59	3	......	......	..
	1907	7720	13948	21668	144	7	......	.....	...
	1908	4536	2891	7427	49	1	1 75	......	....
	1909	8873	4870	13743	91	1/3	2 50	1 50	....

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Adams County Fruit Records—(*Continued*)

Total Fruit Marketed in County.

	Year	No. bbls. shipped in bbls.	No. bbls. shipped in bulk	No. bbls. total	No. cars Apples (150 bbls. to car)	No. cars potatoes 500 bus. to car	Av. price paid per bbl.	Av. price paid per bbl. for bulk	Av. price paid per bus. Potatoes
Total shipped.........	1903	24206	4385	28591	191	...	.....	......	...
	1905	25997	11228	37225	248	52	......	......	...
	1906	13742	4897	18639	124	38	......	.....	....
	1907	42517	33165	75682	504	63	......	.....	....
	1908	16553	2891	19444	129	40	$1 50	$ 75	$ 60
	1909	35910	11296	47206	314	27	2 50	1 50	50
Evaporated...........	1903	......	6547	6547	44	...	......	......	....
	1905	......	10670	10670	71	...	......	.....	....
	1907	......	8333	8333	56	...	....	75	....
	1908	......	......	......	......	...	......	......	....
	1909	......	4666	4666	31	...	......	......	....
Canned.............	1905	.....	2400	2400	16	...	......	......	....
	1907	......	10000	10000	67	...	....	1 00	...
	1908	......	1673	1673	11	...	....	.....	....
	1909	......	12398	12398	82	...	....	......	....
Cider (1000000 gals.)..	1907	......	9524	9524	63	...	......	......	....
	1908	......	6670	6670	44	...	......	......	....
	1909	....	5714	5714	38	...	....	......	....
Total fruit...........	1903	24206	10932	35138	234	...	.....	......	...
	1905	25997	24298	50295	335	52	......	......	....
	1906	13742	4897	18639	124	38	......	......	....
	1907	42517	61022	103539	690	63	2 25	1 75	55
	1908	16553	11234	27787	185	40	1 50	75	60
	1909	35910	34074	69984	465	27	2 50	1 50	50

Comparison of Percentages

Year	Per cent. barreled	Per cent. sold bulk	Per cent. evaporated	Per cent. canned	Per cent. cider	Per cent. total fruit compared to 1903
1903	70	12	18	......	.....	100%
1905	52	22	26	......	......	143%
1907	41	32	8	10	9	295%
1909	51	16	7	18	8	200%

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INDEX

A

Addresses—
  “President's,” 15-17
  “Orchard Fertilization,” 21-36
  “Essential Elements of Success in Fruit Growing,” 36-40
  “Getting Together,” 40-45
  “Discussion of Various Nursery Methods of Propagation for Best Orchard Results,” 45-53
  “Inter-Cropping of Young Orchards with Special Reference to Adams County,” 53-62
  “Some Experiments with Commercial Lime-Sulphur as a Spray for Fruit Diseases,” 62-72
  “Practical Demonstration in the Boxing of Apples,” 72-81
  “Spraying for San Jose Scale and Codling Moth,” 81-92
  “Practical Principles of Profitable Peach Production,” 92-97
Apples—
  Packages, 18
  Varieties, 38
  When to Pick, 73
  Grading, 74
  Wrapping, 76
  Scab on, 62
  French Seedling Recommended, 49
  From Unsprayed Trees (Illustration), 90
Amendments, 13
Arsenate of Lead, 37, 63, 90, 97, 102
  With Lime-Sulphur Solution, 65
Anderson, Jos. W., 52, 60, 61, 101
Anderson, H. M., 85
Adams, W. S., 84, 108
Adams County Mutual Fire Insurance Co. (Adv.), 112
Advertisers—
  American Agricultural Chemical Co. (Fertilizers), 2
  Bateman Mfg. Co. (Cultivators and Sprayers), 4
  Biglerville Warehouse Company (Fertz., Lumb., Grain, Coal), 6
  Goulds Mfg. Co. (Sprayers), 8
  Bowker Insecticide Co. (Spray Materials), 10
  Atlantic Fertilizer Co. (Fertilizers), 12
  Grasselli Chemical Co. (Spray Materials), 14
  B. G. Pratt Co. (Spray Materials), 16
  Spramotor Co. (Spray Machinery), 102
  Merrimac Chemical Co. (Spray Materials), 102
  J. G. Harrison & Sons (Nursery Stock), 104
  John S. Tilley (Ladders), 104
  P. S. Orner (Barrels), 104
  Baugh & Sons Co. (Fertilizers), 106
  W. S. Adams (Lumber and Fruit), 108
  Franklin-Davis Nursery Co. (Nursery Stock), 108
  G. P. Reed (Packages and Cushions), 110
  Adams County Mutual Fire Insurance Co. (Insurance), 112
  Battlefield Nurseries (Nursery Stock), 112
  Dougherty & Hartley (Dry Goods), 112
  Edwin C. Tyson (Everything for the Orchard), 114
Adams County Fruit Records—
  Gettysburg & Harrisburg R. R. Shipments, 109
  Western Maryland R. R. Shipments, 111
  Total Fruit, 113

B

Bateman Mfg. Co. (Adv.), ... 4
Biglerville Warehouse Co. (Adv.), ... 6
Bowker Insecticide Co. (Adv.), ... 10
By-laws, ... 15
Busey, Rev. B. P. S., ... 17
Boxes—
    Standard for Apples, ... 18
    Advantages of, ... 45
    For Orchard Use, ... 73
    Reasons for Using, ... 73
    Material for, ... 25, 80
    Cost of Making, ... 80
Barrels—
    Standard for Apples, ... 18, 104
    Buying Co-operatively, ... 44
    Cushions, Caps and Circles for, ... 110
Bordeaux Mixture, ... 37, 63, 91
    Russetting, Caused by (Illustration), ... 64
Business Methods, Importance of, ... 43
Budded Trees, Advantage of, ... 47
Bud Selection, ... 50
Blight of Pears, ... 50, 66
Brown Rot of Peach, ... 62
Black Rot Canker, ... 67
Bacterial Collar Rot, ... 68
Baldwin Spot, ... 71
    Basic Slag, ... 38
Bassett, C. E., ... 40, 52, 61, 66, 68, 70, 92, 97, 101
Black, W. H., ... 86
Baugh & Sons Co. (Adv.), ... 106
Battlefield Nurseries (Adv.), ... 112

C

Cultivating Machinery, ... 4, 39, 96
Constitution, ... 13
Color, Cause of, ... 23, 26, 28, 32, 38
Cultural Methods, ... 28, 93
Crude Oil as Spray, ... 37
Codling Moth, Treatment for, ... 37, 96
Cold Storage, ... 39
Co-operation, Advantage of, ... 40, 81
Central Packing Houses, ... 43
Crops for Orchards, ... 57
Cover Crops, ... 59, 61, 95
Controlling Fire Blight, ... 66
Commercial Lime-Sulphur, ... 62
Canker, New York Apple, and Black Rot, ... 67
Cost of Packing Apple Boxes, ... 80

D

Dues, ... 13
Duties of Officers, ... 15
Discussion Following Address of
    Prof. Stewart, ... 35
    Mr. Repp, ... 38
    Mr. Bassett, ... 44, 95
    Prof. Wright, ... 48
    Prof. Watts, ... 58
    Prof. Whetzel, ... 65
    Mr. Vincent, ... 79
    Prof. Symons, ... 90
Dried Blood, ... 35

Details of Packing, 75
Dunlap, J. M., 91
Davis, Franklin & Co. (Adv.), 108
Dry Goods, Etc., 112

E

Executive Committee—
  List of, 3
  Duty of, 15
Eldon, R. M., 17, 86, 92, 97
Effect of Fertilizer on Color and Growth, 23
  Of Manures on Yield, 31
  Of Lime Sulphur on Apple Scab, 64
Experiments of Cultural Methods, 28, 33
  With Commercial Lime Sulphur as a Spray for Fruit Diseases, 62
"Essential Elements of Success in Fruit Growing," 36

F

Fennville Fruit Shippers' Association, 41
Fruit Growing, Interest in, 53
Fire Blight, 66
Fenstermacher, P. S., 66
Field Laboratories, 67
Fungous Collar Rot, 68
Fruit Spots, 72
Fohl, Geo., 85
Formula for Bordeaux Mixture, 91
Fruit Committee, 37
  Report of, 100
Fruit Exhibit, 103
  Adams County Records, 109, 111, 113
Fertilizers, 2, 6, 12, 95, 106, 114
  Experiments, 22
  Influence on Color and Growth, 23
  Financial Value of, 26
  Formula Recommended for Trees, 35, 38, 60
For Potatoes, 54, 60
  Tables, 22-7-8-9, 31-2-3
Fungicides, 10, 14, 16, 37, 114
Fungus, Proper Time to Spray for, 72

G

Goulds Mfg. Co. (Adv.), 8
Grasselli Chemical Co. (Adv.), 14
Good Roads, Importance of, 42, 44
"Getting Together," 40
Gasoline Engine Sprayers, 69
Garrettson, E. P., 70
Grading, 74, 80, 81
  Board for (Illustration), 74
Grove, W. E., 80
Gettysburg & Harrisburg R. R. (Fruit Shipments Over), 109

H

Hurrying an Apple Orchard, 68
Harrison, J. G. & Sons (Adv.), 104
Heading Apple Trees, 33, 46

I

Insecticides, 10, 14, 16, 37, 102, 114
Influence of Stock on Scion, 51
"Inter-Cropping of Young Orchards with Special Reference to Adams County," 53

Interest in Fruit Growing, ... 53
Illustrations—
    Results of Spraying with Lime Sulphur (Figs. 1, 2, 3), ... 63, 64
    Grading Board (Fig. 10), ... 74
    Packing Table (Fig. 1), ... 75
    Diagonal Pack (Fig. 2), ... 77
        Method of Starting (Fig. 3), ... 78
    Proper Bulge (Fig. 4), ... 78
    Side View of Boxes (Fig. 5), ... 79
    Nailing Press (Fig. 6), ... 79
    Apples from Unsprayed Trees (Fig. 7), ... 90
    Apples Sprayed Once with Arsenate of Lead (Fig. 8), ... 91
Identifying Fire Blight, ... 66
Insecticide Law, Proposed, ... 97
Insurance, ... 112

J

Judging Committee, ... 39
    Report of, ... 100

K

Koser, G. W. (Adv.), ... 6, 12, 106
Kaines, M. G., ... 52

L

Lafean Apple Package & Grade Bill, ... 18, 99
Lime on Orchards, ... 35, 38
    To Produce Color, ... 39
Ladders Best for Orchard, ... 39, 104
Lime Sulphur as a Spray for Fruit Diseases (Illustrated), ... 62, 63, 64
    For Brown Rot of Peach, ... 65
    Scott's Self-Boiled, ... 65
    For San Jose Scale, ... 82
    Commercial and Home-made Compared, ... 83
    Method of Making, ... 86
    What Part Effective in Killing Scale, ... 89
    Strength to Use Commercial, ... 89
Lecanium Scale, ... 87
    Treatment for, ... 89
Little Peach, ... 96
Lumber, ... 6, 108

M

Membership—
    Roll of, ... 5
    Constitutional Requirement for, ... 13
Manures, Effect of, ... 31
Massachusetts Experiment on Apples, ... 33
Muriate of Potash, ... 35
Marketing, Best Plan for, ... 44, 81
    Sweet Corn, ... 59
Myers, L. M., ... 86
Merrimac Chemical Co. (Adv.), ... 102

N

Nitrogen, Best form for Trees, ... 35
New Jersey Methods, ... 36
Nursery Methods, Description of, ... 45
Nursery Stock, Rules for Ordering, ... 46
    Grown to Order, ... 47
    Home Growing Condemned, ... 52
    National Inspection of, ... 98

New York Apple Canker, 67
Niagara Gas Sprayer, 69
Nozzles, 70
Nailing Press (Illus.), 79
Nurseries, 104, 108, 112

O

Officers—
    List of, 3
    Consist of, 13
    Duties of, 15
    Initiation of, 15
Object of Association, 13
Order of Business, 15
"Orchard Fertilization," 21
Organization, Advantage of, 43
Orchards, Potatoes in, 54
    Sweet Corn in, 55
    Cabbage in, 57
    Small Fruits in, 57
    Tomatoes in, 58
Orchard Boxes, 73
Oil Sprays, 84
Osage Orange Hedges Condemned, 87
Oils Recommended for Peach Lecanium, 89
Orner, P. S. (Adv.), 104

P

Potato Machinery, 4
Pratt Co., B. G. (Adv.), 16
President's Address, 17
Packages, Standard for Apples, 18
Potash, Best Form of, 35
Pruning Apple Trees, 38
Pears, Varieties of, 38
    Blight, 50
Piece Root vs. Whole Root, 50
Peters, Earl, 50
Powell, George T., 51
Pedigreed Trees Recommended, 52
Potato Growing in Orchards, 54
Peach, Leaf Curl, 62
    Brown Rot of, 65
    Lecanium, 87
    Growing of, 92
    Varieties of, 93
    Yellows, 95
Prickett, J. W., 68
Power Sprayers, 68
    Objections to, 69
    Pressure recommended, 70
Proper Time to Spray for Fungus, 72
Pail Recommended for Picking Apples, 73
"Practical Demonstration in the Boxing of Apples," 73
Profit in Boxing Apples, 73
Picking Bag, 74
"Practical Principles of Profitable Peach Production," 92
Packing—
    Plea for Honest, 19
    Houses, 74
    Tables (Illus.), 75
    Styles of, 76
    Starting (Illus.), 77
    Proper Bulge in (Illustration), 78
    Boxes, Cost of, 80
Paris Green, 90

R

Repp, Albert T., 36, 66
Root Grafting, Advantage of, 47, 49
Roberts, Horace, 55
Raspberries, 59
Russetting of Bordeaux, 64
Red Bug, 71
Reed, G. P. (Adv.), 110

S

Spray Apparatus, 4, 8, 39, 68, 102, 114
Spray Materials, 10, 14, 16, 102, 114
Standard Apple Boxes, 18
    Insecticides, 98
Stewart, Prof. J. P., 21
Sulphate of Potash, 35
Sod Mulch, 28, 29, 30, 35
Success in Fruit Growing, 36
San Jose Scale, Remedy for, 37, 82
Slag (Basic), For Trees, 38
Selection of Apple Seedlings, 50
Sweet Corn in Orchards, 55, 57
Small Fruits, 57
Spraying, Time for, 63
Spraying in Summer to Remove Scale from Fruit, 70
Side View of Boxes After Nailing (Illus.), 79
Spraying for San Jose Scale and Codling Moth, 81
Symons, Prof. Thos. B., 81
Spramotor Co. (Adv.), 102
Stoner, C. A. (Adv.), 112

T

Tillage Experiments, 28
Transportation Charges Lowered by Co-operation, 42
Trees—
    Propagation of, 45
    Heading of, 46
    Advantage of Budding, 47
    Advantage of Pedigreed, 48
Tomatoes, 58
Time for Spraying, 63
Terrapin Scale, 87
Trimming Peach Trees, 96
Tilley, John S. (Adv.), 104

U—V

Varieties, Pears, 38
    Apples, 38
    Peaches, 93
Vincent, C. C., 66, 68, 72
Vote of Thanks, 97

W

Wright, Prof. W. J., 45, 60
Watts, Prof. R. L., 50, 53
Whetzel, Prof. H. H., 62
When to Pick Apples, 73
Wrapping Apples, 76
Western Maryland Railroad, Shipments Over, 11

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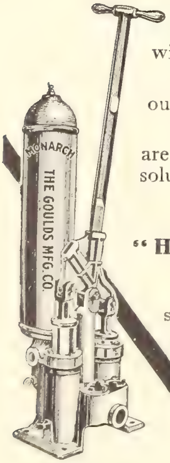

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Hummel, P. T.,	Harrisburg, Pa.
Huber, Henry S.,	Gettysburg, Pa.
Hazard, Willis Hatfield,	West Chester, Pa.

Jacobs, Samuel,	Gettysburg, R. F. D. No. 5, Pa.

Keller, H. M.,	Gettysburg, R. F. D. No. 5, Pa.
Klinefelter, U. S.,	Biglerville, Pa.
Kane, J. A.,	Biglerville, Pa.
Kane, J. Lewis,	Gettysburg, R. F. D. No. 6, Pa.
Knouse, J. A.,	Arendtsville, Pa.
Knouse, David,	Arendtsville, Pa.

BUY YOUR ARSENATE of LEAD IN POWDERED FORM

And save freight on the 40-60% of water all insecticide pastes contain

Electro Arsenate of Lead

(IN POWDERED FORM)

is the only successful dry Arsenate of Lead, because it is the only one in amorphous (not flaky, granular, or crystalline) form. This is made possible through our Electro Process which assures, also, at least 33 per cent. arsenic oxide, making Electro the strongest Arsenate of Lead made, and consequently, the most effective and economical. As it contains less than ½ of 1 per cent, soluble arsenic oxide, it is harmless to even peach foliage.

Because of its finely divided form Electro goes into suspension at once and remains so a long while. This assures an even distribution and enables the Arsenate of Lead to get into the plant tissues where it will be death to insects months after application. It won't wash off.

Analysis of Electro Arsenate of Lead made by the New Jersey and Connecticut Agricultural Experiment Stations prove our claims. Send to the stations or us for these reports and satisfy yourself.

We supply Electro in paste form if you prefer. It is packed with the least quantity of water (40 per cent.) because Electro paste goes into suspension readily even after drying.

Electro Lime-Sulphur Solution

(CONCENTRATED)

is guaranteed to average not less than 32 per cent. Baume and to contain the maximum percentage of poly-sulphides of calcium. This gives an excess of soluble sulphur, the active insecticide. Electro Lime-Sulphur is an absolutely clear liquid, and conforms to all State and Federal laws. It is certain death to San Jose Scale, and all scale and sucking insects. Washing the bark with it gives a smooth, healthy growth.

Electro Lime-Sulphur Solution is packed in 50-gal. bbls. ; 30-gal. ½ bbls. ; 5-gal. and 1-gal. cans.

Visit our booth at the convention and investigate Electro products thoroughly. *The material exhibited is the material we ship.*

The Vreeland Chemical Co.

"Dept. C.," 50 Church St., New York City

Koser, Rev. D. T.,	Arendtsville, Pa.
Koser, G. W.,	Biglerville, Pa.
Klepper, C. H.,	Arendtsville, Pa.
Longsdorf, C. L.,	Biglerville, Pa.
Lawver, Rufus W.,	Biglerville, Pa.
Lawver, J. Edw.,	Biglerville, Pa.
Longsdorf, Dr. H. H.,	Dickinson, Pa.
Lower, Reuben,	Biglerville, Pa.
Lady, Hiram C.,	Arendtsville, Pa.
Lupp, Reuben,	Biglerville, Pa.
Lau, L. B.,	East Berlin, R. F. D. No. 3, Pa.
Large, Mrs. E. S.,	Orrtanna, Pa.
Large, Miss Katherine,	Orrtanna, Pa.
Michener, Chas.,	Bendersville, Pa.
Michener, Mrs. Chas.,	Bendersville, Pa.
Myers, George P.,	Biglerville, Pa.
McIlhenny, Wm. B.,	Gettysburg, Pa.
McKay, Geo. H.,	Philadelphia, Pa.
Mayer, Dr. I. H.,	Willow Street, Pa.
Morrison, Mrs. W. S.,	Aspers, Pa.
Miller, John H.,	Aspers, Pa.
Minnich, D. N.,	Chambersburg, Pa.
Miller, N. G.,	Marion, Pa.
Miller, C. C.,	Marion, Pa.
Minter, Thomas L.,	Biglerville, Pa.
Musselman, C. H.,	Biglerville, Pa.
Minter, D. G.,	Gettysburg, R. F. D. No. 5, Pa.
Myers, Levi M.,	Siddonsburg, Pa.
McCauslin, Abram W.,	Biglerville, Pa.
McCauslin, George W.,	Biglerville, Pa.
Moyer, Mrs. H. P.,	Cape May, N. J.
Mickley, J. W.,	Fairfield, R. F. D., Pa.
Mickley, I. D.,	Cashtown, Pa.
Morgan, Miss F. K.,	Orrtanna, Pa.
Musser, Will. M.,	Lampeter, Pa.
Myers, Emory J.,	York Springs, Pa.
Newcomer, Aaron,	Smithsburg, Md.
Newcomer, J. M.,	Waynesboro, Pa.
Osborne, C. L.,	Biglerville, Pa.
Osborne, Allen,	Biglerville, Pa.
Oyler, Geo.,	Gettysburg, R. F. D. No. 5, Pa.
Oyler, George C.,	Gettysburg, R. F. D. No. 5, Pa.
Ogden, David,	Aspers, Pa.
Orner, P. S.,	Arendtsville, Pa.
Prickett, Josiah W.,	Biglerville, Pa.
Prickett, Mrs. E. M. G.,	Biglerville, Pa.
Peters, Earl,	Mt. Holly Springs, Pa.
Peters, Z. J.,	Guernsey, Pa.

"One for All," No. 1

Made of Wool Grease, Arsenate of Lead, Lime and Sulphur,

is both a contact and poison spray; both an insecticide and fungicide; is positively the only thing needed for any pest or fungus diseases that can be controlled by spraying.

Port Treverton, Pa,, Sept. 26, 1910.

Manhattan Oil Company,
51 Front St , New York City.

Gentlemen :—I used your "ONE FOR ALL" last spring. As soon as possible in October I will use it again.

I was able to sell peaches and plums from three year old trees. From 900 trees I gathered two bushels to a quart of very fine peaches, I did not see any marks of curculio, nor scale, these results could not have been obtained on three year trees without spraying as I did. ***The grease seemed to protect the trees from frost and insects and curl leaf.***

We cannot expect much on 3 year set out trees. I used "ONE FOR ALL" also on Japan Plums, and got such a crop that I propped up, and sold such sorts as Red June Abundance,Burbank and Yellow Japans at ten cents a quart. Other people right alongside of me had no plums at all. I had no curculio, and used no other spraying than with your "ONE FOR ALL" on these trees.

I found out another point which I used profitably, we made bands of muslin four to six inches wide, and bound them around covered with "ONE FOR ALL" on sweet and sour cherries, Japan Plums and apple trees, ***and had no aphis*** upon these trees, while I'm not sure that it kept back the curculio, I think curculio found sticky walking.

I have been terribly pestered with black aphis on cherry trees and on Wickson (Japan Plums) but this bank of "ONE FOR ALL" kept them off, spring and summer.

It is just as effective on currant bushes for worms and on rose bushes for lice and bugs. I used it on cucumbers and melon vines with clean results, I think well of it, gentlemen.

Yours truly,
F. L. HANCOCK.

P. S.—Perhaps you or someone might ask "how many trees, and stuff has this man got?" Well, I have 3038 trees out and truck some, and grow small trees for nursery budding. I did not use "ONE FOR ALL" upon all my trees, having used some oil, home-made lime and sulphur and some bought lime and sulphur, but when one considers that yours is ONCE FOR ALL, with time saved and less cost, why it pays to use "ONE FOR ALL." for when I used the other thing I had to spray afterwards with arsenate of lead and risk burning of my foliage, besides the time lost.

Yours truly,
F. L. HANCOCK.

Arlington, N. Y., Sept. 1st, 1910.

Manhattan Oil Company,
51 Front St., New York City.

Dear Sirs:—Please excuse me for not answering your inquiry before, as I was waiting for the plum season to be over.

I think the name "ONE FOR ALL," is not right, it should be "BEST OF ALL." The Japan plum trees used on were more than thatched with scale. I gave one thorough spraying just before the blossoms opened, and failed to find more than one or two plums with any on them. The trees are doing well this summer. The apple trees are fine, the bark looks bottle green, and no scale.

Wishing you success,

Yours truly,
W. H. BROWER.

PRICES F. O. B. NEW YORK

	One for All, No. 1.	
Barrels, 425 lbs.	.05c.	a lb.
½ Bbls., 200 lbs.	.05½	"
100 lbs.	.06	"
50 lbs.	.06½	"
25 lbs.	.08	"

MANHATTAN OIL CO.

51 Front Street :: NEW YORK

Peters, W. R.,	Aspers, Pa.
Peters, Geo. M.,	Aspers, Pa.
Peters, Curtis,	Biglerville, Pa.
Peters, John N.,	Bendersville, Pa.
Pitzer, Harry C.,	Aspers, Pa.
Pitzer, Ira D.,	Biglerville, Pa.
Patterson, Jas. A.,	Stewartstown, Pa.
Pratt, B. G.,	New York City.
Pittentorff, C. S.,	York Springs, Pa.

Raffensperger, Chas. E.,	Arendtsville, Pa.
Raffensperger, Roy,	Arendtsville, Pa.
Rice, E. E.,	Aspers, Pa.
Rice, C. E.,	Biglerville, Pa.
Rice, Waybright,	Biglerville, Pa.
Rice, C. S.,	Arendtsville, Pa.
Rice, Luther S.,	Arendtsville, Pa.
Rice, Oscar C.,	Arendtsville, Pa.
Routzahn, George R.,	Bendersville, Pa.
Rinehart, E. S.,	Mercersburg, Pa.
Rinehart, J. J.,	Smithsburg, Md.
Roberts, Arthur,	Gettysburg, R. F. D. No. 5, Pa.
Rittenhouse, Dr. J. S.,	Lorane, Pa.
Repp, Albert T.,	Glassboro, N. J.
Riddlemoser, H. E.,	McKnightstown, Pa.
Roth, John,	Biglerville, Pa.
Rice, Edwin A.,	Arendtsville, Pa.

Stover, Dr. J. G.,	Bendersville, Pa.
Stover, Mrs. J. G.,	Bendersville, Pa.
Slaybaugh, E. B.,	Aspers, Pa.
Slaybaugh, Elmer,	Aspers, Pa.
Smith, G. Frank,	Aspers, Pa.
Smith, J. H.,	Biglerville, Pa.
Shank, C. G.,	Biglerville, Pa.
Shank, George H.,	Biglerville, Pa.
Shank, C. B.,	Biglerville, Pa.
Sheely, Daniel M.,	Tillie, Pa.
Sheely, Allen,	Bendersville, Pa.
Schlosser, Ira,	Aspers, Pa.
Shull, Jno. A.,	Tillie, Pa.
Shull, Robt. H.,	Tillie, Pa.
Sandoe, H. P.,	Biglerville, Pa.
Stoner, C. A.,	Gettysburg, Pa.
Schuchman, G. W.,	Carlisle, Pa.
Sterrett, D. Kerr,	Oakville, Pa.
Sharpe, James A.,	Shippensburg, R. F. D., Pa.
Stahle, Charles E. ,	Gettysburg, Pa.
Spangler, George E.,	Gettysburg, Pa.
Stewart, Prof. J. P.,	State College, Pa.
Snyder, E. B.,	Jack's Mountain, Pa.
Snyder, Jacob S.,	Idaville, R. F. D., Pa.
Snyder, W. L.,	Bendersville, Pa.

The State of Pennsylvania Appropriates

$30,000 ANNUALLY

to teach the farmer how to use LIME-SULFUR, yet apples from trees sprayed with

"SCALECIDE"

for the past five years took all the first prizes at the State Horticultural Society meeting at Tunkhannock.

THE REASON:---The longer trees are sprayed with "SCALECIDE," the more beautiful, healthful, and fruitful they become.

"SCALECIDE" not good for peaches?

Mr. Roy Lamer of Cobden, Illinois last year sold $12,361 worth of peaches from 2000 trees which have been sprayed for several years with "SCALECIDE."

Do not fail to make a trial of our

"SULFOCIDE"

the cheapest and most effective substitute for Boadeaux MIxture.

B. G. PRATT COMPANY

MANUFACTURING CHEMISTS

50 Church St., NEW YORK CITY

EDWIN C. TYSON, Flora Dale Pa., State Agent for Pennsylvania

Stauffer, Chas. B.,	Gettysburg, Pa.
Spangler, A. R.,	Aspers, Pa.
Sachs, Edw.,	Biglerville, Pa.
Shoemaker, J. M.,	Mechanicsburg, Pa.
Sharrah, Jacob,	McKnightstown, Pa.
Strasbaugh, E. F.,	Orrtanna, Pa.
Sheaffer, Henry C.,	Dillsburg, No. 1, Pa.
Sheely, A. D.,	Arendtsville, Pa.

Tyson, Edwin C.,	Flora Dale, Pa.
Tyson, Mrs. M. W.,	Flora Dale, Pa.
Tyson, Chester J.,	Flora Dale, Pa.
Tyson, Mrs. B. H.,	Aspers, Pa.
Tyson, Wm. C.,	Guernsey, Pa.
Tyson, Mrs. M. E.,	Guernsey, Pa.
Tyson, A. R.,	Norristown, Pa.
Taylor, I. P.,	Biglerville, Pa.
Taylor, Hanson W.,	Biglerville, Pa.
Taylor, Daniel R.,	Biglerville, Pa.
Taylor, Henry,	Biglerville, Pa.
Taylor, A. M.,	Biglerville, Pa.
Taylor, Jacob,	Arendtsville, Pa.
Taylor, Jerry,	Aspers, Pa.
Trostle, Francis,	York Springs, R. F. D., Pa
Thomas, Mrs. Dr.,	Gettysburg, Pa.

Weidner, A. I.,	Arendtsville, Pa.
Weidner, Geo.,	Aspers, Pa.
Wolfe, C. A.,	Aspers, Pa.
Wolfe, Harry,	Aspers, Pa.
Wolf, Dr. W. E.,	Arendtsville, Pa.
Wolf, Charles M.,	York Springs, Pa.
Weaver, Mrs. C. M.,	New Oxford, Pa.
Weaver, David,	Biglerville, Pa.
Wilson, B. F.,	Biglerville, Pa.
Weaner, Chas. C.,	Bendersville, Pa.
Weaner, W. C.,	Aspers, Pa.
Wert, R. S.,	Biglerville, Pa.
Wertz, D. M.,	Quincy, Pa.
Wible, R. E.,	Gettysburg, Pa.
Wickersham, Ruth A.,	Bendersville, Pa.
Wickersham, Robt. A.,	Bendersville, Pa.
Wagner, Harry,	Carlisle, Pa.
Woodbourne, D. Sterrett,	Shippensburg, Pa.
Woodbourne, John S.,	Newville, Pa.
Wright, Ryland,	Aspers, Pa.
Weigle, H. M.,	Harrisburg, Pa.
Wisotzkey, J. M.,	Gettysburg, Pa.
Williams, J. L.,	Gettysburg, Pa.
Walter, J. C.,	Biglerville, Pa.
Warren, Blain	Bendersville, Pa.

Best Wishes for a

HAPPY NEW YEAR

AND A

Big Crop of Apples

TO ALL

Adams County Fruit Growers

◆

Musselman Canning Co.

Biglerville, Pa.

CONSTITUTION

Preamble.

Being interested in fruit growing and believing that, by organization, we may materially advance our common interests, we hereby adopt the following Constitution and By-Laws:

Article I.—*Name.*

This Association shall be known as The Fruit Growers' Association of Adams County.

Article II.—*Object.*

The object of this Association shall be to encourage the co-operation of the fruit growers of Adams County for the protection and advancement of their common interests.

1st. By securing and disseminating such scientific and practical information as shall promote the general advancement of the fruit growing interests in this county, and shall tend to the improvement of the quality and quantity of our products.

2d. By securing such legislation as may be advantageous, and preventing that which may be detrimental.

3d. By securing such improved facilities in transportation as shall tend to give us more expeditious and economical distribution.

4th. By endeavoring to secure a better and more uniform system of packing and package.

5th. By devising some system of marketing our products which will open up and develop the markets and give to the grower a fair and remunerative return.

6th. And by endeavoring to obtain such improved systems of crop reporting as shall furnish, through co-operation with other similar Associations, accurate information concerning production; thereby enabling the fruit grower to know the exact situation.

Article III.—*Membership.*

1st. Candidates for membership may be elected by a majority vote of the members present, and upon the payment of $1.00 into the treasury shall be entitled to membership until the next Annual Meeting.

2d. Any member may renew his membership by the payment of annual dues, but upon failure to pay dues within three months after Annual Meeting, shall require re-election.

3d. No member shall receive the benefit of commissions or of co-operative buying by the Association, to an amount greater than $1.00 for the term of one year after election to membership.

Article IV.—*Dues.*

The annual dues of this Association shall be One Dollar ($1.00) payable to the treasurer at the meeting immediately preceding the annual meeting, for which the treasurer shall issue a receipt, this receipt to constitute a certificate of membership for the succeeding year.

Article V.—*Officers.*

Its officers shall consist of a President, a First, Second, Third, Fourth, and Fifth Vice President, a Recording Secretary, a Corresponding Secretary, and a Treasurer, all of whom shall be elected by ballot at each Annual Meeting, to serve for the term of one year or until their successors shall be chosen. These nine (9) elective officers shall constitute an Executive Committee.

VISIT OUR EXHIBIT OF

EASTERN GROWN APPLES

UNTIL FEBRUARY 1st, 1911

We have on exhibit during January at the **Reading Terminal Market, Philadelphia,** car loads of Eastern grown apples—Winesap, Ben Davis, York Imperial, Stayman's Winesap, Albemarle Pippin and others, to show what can be grown in the East. Geo. H. McKay, mgr. of exhibit.

We also have a carload of fruit and ornamental trees, showing we can grow trees.

WE HAVE AT OUR NURSERIES:

100,000	**GRAPE VINES—Concord and Moore's Early**
200,000	**PEACH TREES—100 Varieties**
200,000	**APPLE TREES—100 Varieties, 1 and 2 years**
50,000	**PEAR TREES—1, 2 and 3 years**
50,000	**CHERRY TREES—1 and 2 years**
20,000	**PLUM TREES—1 and 2 years**
500,000	**CALIFORNIA PRIVET—all grades**
10,000,000	**STRAWBERRY PLANTS**
100,000	**NORWAY MAPLES**
100,000	**NORWAY SPRUCE**

and a large acreage of other shade and ornamental trees, all of which are in fine condition and ready for immediate shipment.

Can we talk business? If you intend planting stock in the spring, won't you kindly fill out the attached coupon and mail same to us to-day? You do not place yourself under any obligations whatever by doing this, but I should be glad to have the opportunity of giving you our prices.

New catalogue on how to grow fruit in the East FREE

HARRISON'S
NURSERIES
BERLIN, MD.

HARRISON'S NURSERIES, Berlin, Md.

Name ______________________________

Town ______________ *County* ______________

State ______________________________

I am interested in the following for spring planting;

____

ARTICLE VI.—*Quorum.*

Five (5) members shall constitute a quorum for the transaction of business.

ARTICLE VII.—*Amendments.*

The Constitution and By-Laws of this Association may be amended at any regular meeting by a two-thirds vote of the members present, a notice of the proposed amendment having been presented in writing at a previous regular meeting.

ARTICLE VIII.—*Fruit Districts.*

For the purpose of distributing the work of the Association and extending its scope, the County of Adams shall be divided into the following seven (7) districts: District One, or North District, to consist of Menallen Township; District Two, or West District, to consist of Franklin Township; District Three, or Southwestern District, to consist of Highland, Liberty and Hamiltonban Townships; District Four, or South District, to consist of Cumberland, Freedom and Mt. Joy Townships, and that portion of Straban Township lying south of the Western Maryland Railroad; District Five, or Eastern District, to consist of Germany, Union, Conowaga, Mt. Pleasant, Oxford, Reading, Berwick and Hamilton Townships; District Six, or Northeastern District, to consist of Latimore, Huntingdon and Tyrone Townships; District Seven, or Central District, to consist of Butler Township and that portion of Straban Township lying north of the Western Maryland Railroad.

ARTICLE IX.—*Committees.*

The following five (5) committees shall be appointed annually by the newly-elected Executive Committee and announced at the January meeting, as follows: A committee on programs, a committee on membership, a committee on statistics, a committee on exhibits and a committee on crop reports; each committee shall be composed of one or two members from each of the seven (7) districts of Adams County, as designated in Art. 8, and one or two from each of the Counties of York, Cumberland and Franklin.

BY-LAWS

ARTICLE I.—*Duties of President.*

The President shall preside at all meetings of the Association and have a general supervision of its affairs.

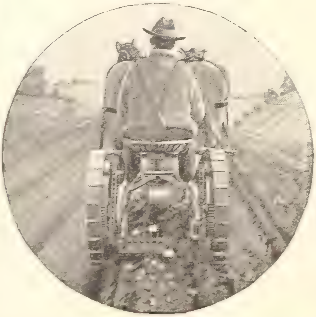
ARTICLE II.—*Duties of Vice Presidents.*

The highest designated Vice President present at any meeting shall preside in the absence of the President; all of the five vice presidents shall serve on the Executive Committee in conjunction with the other elective officers; and, in addition, each vice president shall have special duties as follows:

The First Vice President shall be chairman of the program committee, and be responsible for the preparation of a program for each regular meeting, same to be announced at the preceding meeting.

The Second Vice President shall be chairman of the membership committee, and shall use every effort, personally and through members of his committee, to extend the membership and secure renewals.

The Third Vice President shall be chairman of the committee on statistics, and shall be responsible for the preparation of statistics showing number of orchards in Adams County, and, as far as possible, in York, Cumberland and Franklin Counties, with quantity, age, kind and variety of trees planted therein, for the use of the Association, adding thereto as new orchards are planted or old ones extended.



Plant, cultivate, spray and
dig your potatoes
with

IRON AGE
Machines

IRON AGE PLANTERS

Plants 100% perfect, no misses, no doubles, even spacing, perfect placing. No injury to seed—no pickers are used. Fertilizer does not touch seed.

IRON AGE RIDING CULTIVATORS are adjustable for any width rows and to suit all conditions of crop and soil. Can cultivate in rows 28 inches wide.

IRON AGE SPRAYERS

Protect against bugs and blight. Furnished with Single or Double Acting Pumps, Wood Wheels or Steel. 55 gal. Steel Tanks or 100 gal. Wood Tanks. Thills or Combination.

IRON AGE DIGGERS

Harvest all your crop without waste. Light draft and convenient.

Ask fot 1910 complete IRON AGE catalog of potato machinery' garden tools, cultivators, horse hoes, etc.

Manufactured by
BATEMAN MFG. CO.
BOX 54
GRENLOCH, N. J.

The Fourth Vice President shall be chairman of the committee on exhibits, and have entire charge of securing fruit for exhibits and displaying same as directed by the Association.

The Fifth Vice President shall be chairman of the committee on crop reports, and have entire charge of collecting and compiling same for use of the Association.

ARTICLE III.—*Duties of Recording Secretary.*

The Recording Secretary shall write the minutes of the meetings of the Association and have charge of its Records and Reports.

ARTICLE IV.—*Duties of Corresponding Secretary.*

The Corresponding Secretary shall conduct the correspondence of the Association and shall receive for so doing his necessary expenses for stationery, postage, etc. He shall also act as Recording Secretary in the absence of that officer.

ARTICLE V.—*Duties of Treasurer.*

The Treasurer shall receive and keep an accurate account of all moneys belonging to the Association, paying out same on an order of the Association, signed by the President. He shall make a report of all receipts and disbursements at the annual meeting or at any time at the request of the Association. He shall mail a notice of dues to all members one week prior to the November meeting, at which time all dues are payable, and shall issue certificates of membership in exchange for all dues received. He shall also keep a roll of members who have complied with Article IV of the Constitution and embody same in his annual report.

ARTICLE VI.—*Duties of the Executive Committee.*

The Executive Committee shall have general supervision of the affairs of the Association, auditing all bills and accounts and carrying out the purposes of the Association.

ARTICLE VII.—*Meetings.*

There shall be a regular meeting of the Association on the second Saturday of each month at 7:30 P. M., unless otherwise ordered. The meeting held in December to be regarded as the Annual Meeting. Special meetings may be convened by the Executive Committee at such time as they may appoint.

ARTICLE VIII.—*Initiation of Officers.*

All new officers shall assume the duties of office at the opening of the meeting immediately following the one at which they were elected, except that the newly-elected Executive Committee shall prepare and announce, at the January meeting, the membership roll of the five (5) committees specified in Art. 9, and the chairman of program committee shall prepare a program for the February meeting and announce same at the January meeting.

ARTICLE IX.—*Order of Business.*

1st. Reading of minutes of previous meeting.
2d. Nominations and elections.
3d. Reports of committees.
4th. Deferred business.
5th. Communications.
6th. New business.
7th. Discussion of questions.

SCALIME

SCALIME IS A CONCENTRATED SOLUTION OF LIME & SULPHUR

"Equal to the Best, and Better Than the Rest"

"TABLE A"

From Bulletin of November, 1909, Penna. Dept. of Agriculture, Dr. H. A. Surface, Economic Zoologist.

SOLUTION OF BRAND	Dilution usually recommended — diluted accordingly.	Pounds of Sulphur in Solution per 50 gallons spray.	Specific gravity of diluted solution at 15 deg. C.	Dilution necessary to equal the strength of the 17-22-50 formula.
Lion Brand	1-11	7 2 lbs.	1.020	About 1 to 6
Niagara (clear)	1-11	9.5 lbs.	1.025	About 1 to 7
Thomson (Orchard)	1-11	10.5 lbs.	1.026	About 1 to 8
Rex	1-11	12.5 lbs.	1.030	About 1 to 10
Snavelly's	1 11	5 lbs.	1.016	About 1 to 4
Grasselli's	1-11	10 lbs.	1.026	About 1 to 8
Niagara (dark--top liquid)	1-11	9.5 lbs.	1.025	About 1 to 7
Sulfocide (Pratt)	1-11	30 per cent. sol. sulph.	1.041	
Home boiled 17-22-50 (boiled 2 hours) closed	....	16 to 17 lbs.	1.042	
Salimene	1-11	....	1.004	
Neverscale (powder 1 lb. to 1 gal.)	....	6.7 lbs.	1.019	
17-22-50 boiled 4 hours, closed kettle	....	....	1.041	
Snow's L. & S.	1-11	....	1.020	About 1 to 6
Scalime	1-9	....	1.030	About 1 to 10
Sherwin William's L. & S.	1-10	....	1.028	About 1 to 9

PROF. JOHN P. STEWART, who is the author of Pennsylvania State College Bulletin No. 92, on concentrated Lime-Sulphur, says: "A concentrated Lime-Sulphur should be a clear solution of known, definite strength and contain nothing but Lime, Sulphur and Water."

If the liquid is not clear it may have been doctored to increase the density, if the strength or density is not known it will be impossible to dilute it properly to obtain sprays of different densities, and if it contains anything except Lime, Sulphur and Water, the added substances are of no advantage and may be a detriment.

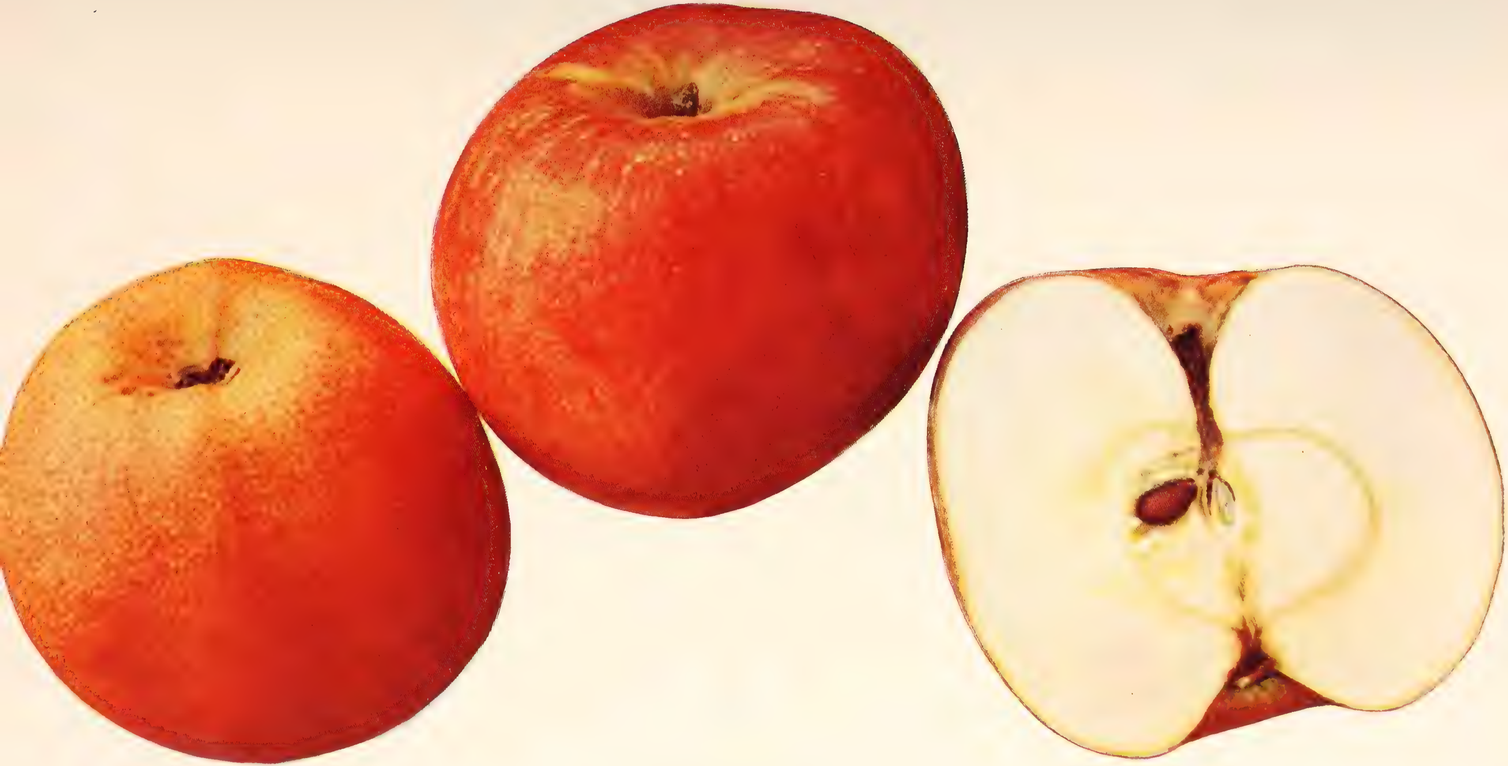
GUARANTEE

SCALIME. We guarantee that SCALIME contains nothing but Lime-Sulphur and Water, and that the strength or density is 1.30 s. g (33 degrees Baume) and if diluted in the proportion of 1 gallon SCALIME to 9 gallons water will kill all the SAN JOSE SCALE with which it comes in contact.

Don't buy any Lime and Sulphur Solution unless the strength is guaranteed

We handle the Hardie Sprayers and carry a full line of their goods, consisting of Power Sprayers, Barrel Sprayers, Hose, Nozzles, Bamboo Rods and other accessories and repairs at our Plant in Martinsburg, W. Va. WRITE US FOR PRICES.

Horticultural Chemical Co., 1210 COMMONWEALTH TRUST BUILDING
PHILADELPHIA, PA.



YORK IMPERIAL

THE YORK IMPERIAL.

The York Imperial apple is the standard commercial variety grown in the Adams County fruit belt. The trees, being thoroughly acclimated, are uniformly thrifty and vigorous wherever proper cultural methods are followed.

The excellent quality of the York Imperial apple and its attractive appearance, as indicated by the accompanying illustration, have been large factors in building up the excellent reputation of the apples from this section.

Historical.

The following excellent historical account of the York Imperial is given by Taylor: "The variety bearing this name originated early in the last century on a farm adjoining the then borough of York, Pa. The attention of the owner, Mr. Johnson, was attracted by the presence of schoolboys who visited it in early spring to get the apples that had passed the winter on the ground, covered by leaves. On securing some of the fruit he found it in fine condition, and when the next crop was ripe took specimens to Mr. Jonathan Jessop, a local nurseryman, who began the propagation of the variety before 1830, under the name 'Johnson's Fine Winter.' Under this name it was known until after the middle of the century, when, after an inspection of specimens the late Charles Downing pronounced it the 'Imperial of Keepers' and suggested that it be named 'York Imperial.' Mr. Jessop did not find ready sale for trees of the variety at first, and dumped the surplus trees from his nursery into a hollow beside the turnpike passing his place. They were picked up by farmers returning from market and taken home for planting on their farms in the lower end of York County. After its merits as a variety for market orchards was established, it became widely distributed throughout Pennsylvania, Maryland and Virginia, and soon became a leading market variety in those States."

Appreciative.

Dr. Funk, in his "Fruits for Pennsylvania," has the following to say in appreciation of the value of York Imperial as a commercial proposition:

"There is no apple on the list that has gained more rapidity in popularity than the York Imperial. It has been steadily forging to the front until it is now one of the leading export apples, bringing prices almost equal to the famous Newton and Albemarle Pippin. Thousands of trees of this variety are being planted annually in Adams County. This section is becoming noted for producing this apple in the highest state of perfection, and buyers from distant parts come and purchase the fruit in the orchard. Fruit is above medium in size, skin greenish yellow, nearly, and sometimes entirely covered with bright red; flesh crisp, tender and juicy, aromatic; retains its flavor and keeps well with or without cold storage; season all winter."

Numerous instances are on record where this variety has produced an average annual net income of over $200.00 per acre, some special cases showing a net return of over $500.00 per acre in one season.

PROCEEDINGS

OF THE

SIXTH ANNUAL CONVENTION

OF THE

FRUIT GROWERS ASSOCIATION

OF

ADAMS COUNTY, PA.

The Sixth Annual Convention was called to order by the President, Robt. M. Eldon, at 2:00 p. m., Wednesday, December 14, 1910, in Fruit Growers' Hall, Bendersville, Pa.

The convention was opened with prayer by the Rev. B. P. S. Busey.

PRESIDENT'S ADDRESS.

Robt. M. Eldon.

The problem of the Adams County Fruit Growers' Association is to hold each year a better convention. We shall be pleased indeed to do this during this week. There is no expectation of furnishing a program that shall be novel throughout or in large part, even if that were desirable, but new tailors for new clothes, may add interest to subjects which have been discussed more or less regularly since the growing of fruit was begun and discussions had. It will be, then, not so much the declarations of new methods as the perfection of old ones by addition of elimination. We are willing and anxious to hear the latest and best of everything from the planting of raw land to the receipt of returns for fruit marketed.

Can planting be overdone, and especially will planting in the East be overdone is a question which is frequently heard. Some say that it is now too late to plant trees; if they were now grown and ready to bear, all well and good, but by the time the new-planted ones are ready to bear in seven to eleven years the market will be overstocked. We certainly think that the year 1900 was a better year for planting than the year 1910, being first on the field is always a great advantage, but that there will be a good market for the good crops of the 1910 planted trees we also fully believe. Not everybody is planting trees or expects to do so, and many of the trees planted so lately as 1900 are dead as they can be. Certainly many of those planted earlier are gone. It is the exception to see even in Adams county a thrifty kitchen orchard or farmer's orchard.

One argument and a good strong one why the eastern orchards are going to succeed is that the best markets are within easy reach; are right at our doors, in fact. Observe the eightieth meridian passing through Pittsburg and Charleston and see what our eastern home markets are. East of this are to be found two of the greatest cities in the world; eight others, each with a population in excess of 250,000. Three of the eight have nearly 600,000 each. Of fifty American cities with 100,000 or more, almost the half are here. Of one hundred seventy-eight cities with less than 100,000 and more than 25,000 nearly the half are here. While the little cities and the big boroughs are too many to name. These great cities, these big cities and the lesser cities, boroughs and towns are not only here and are ours to supply, but the census reports also show that they grow, and are growing generally faster than those of the West and Middle West.

Let us plant more orchards and plan to keep them. We are the best placed geographically. Our land is relatively cheap, and there are no charges for water, and as to water control, all we need do is to plant the slopes and upland. The matter of irrigating the orchard requires the skill of the expert, and already there is something wrong with many of the western irrigated orchards. We are slower in production of crops but we will be here when the other fellow is out.

And while we have the whip hand on the western grower in the matter of haulage and freights yet the railways with the "short haul" and "long haul" idea are keeping in the way of our having reasonable freight rates, making up in part what they lose in distance by higher local rates. The express companies are their willing allies. We cannot send small packages of fruit by express profitably. If I send a single basket to Harrisburg it is the minimum charge of 35 cents. If I send it by the Adams Company, it is twice the minimum or the usual selling price of the product. I could not ship a large quantity of peaches by express to populous Rhode Island unless in a year of very high prices and make a profit. Let us use our congressmen in getting after the express companies by way of a parcels post. We possibly could not deliver fruit by mail but a general parcels post would work havoc with the present too high rate of the expressman.

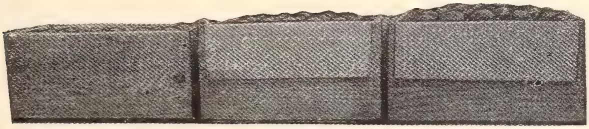
We need a proper storage place for our increasing apple crops. As it is we now or very soon must sell from the orchard at the buyer's price, because the cold storage warehouse is either bought up in advance or is too far away. Can we not build a local plant and manage it locally? It would remove the necessity of selling at picking time. It would pay and would give to the grower a choice between selling and storing which is necessary to give him a fair share.

As to the Adams county crops this year, it might be said, that though it was what we call the off years it was about equal to the best previous full year crop. Whether the young trees now beginning to bear will drop into the apparently established habit of the old ones, or whether we shall cease to have an off year, will be interesting to note. Perhaps when we regularly thin the apples, regular annual cropping will be the rule.

Spraying is now generally practiced by the Adams county growers. To spray to kill the scale or to insure against its dangerous occurrence is now accepted as good orchard practice. While, heretofore spraying has been directed against scale to keep the tree alive, it will hereafter be particularly dircted to the object of perfecting the crop. The problem will be to keep the foliage in perfect condition, to prevent scab, blight, rust and rot, to protect the foliage and fruit from the attacks of vermin that chew. We are already able to get good arsenicals and let us hope that National legislation will shortly insure their quality. Let us hope that some formula of lime and sulphur will give to the orchardist a cheap and perfect summer spray.

The difficulties in the marketing of the year's apple crop keep us alive to the need of package legislation. Let us urge National enactment and let us hold firmly to the old-fashioned idea of making a measure a full measure; a bushel named, a bushel in fact. Doubtless the western grower will cling to the notion that a bushel box must be regulated by the size of western apples, and the soon to be exploded idea that boxed apples are only grown in the West. If no National law is enacted in the near future, the eastern states are certain to pass statutes regulating packages which will no doubt be difficult for the western grower to meet with the short boxes in vogue there. I hope that the Appalachian growers, as suggested by recent organizations in Virginia and New York will not attempt legislation until harmony prevails throughout the East. With the program filled by men from all sections of the East, we should know before the close of this convention something of eastern sentiment.

The Adams county growers welcome you to their sixth convention.



LEFT BOX TOO FLAT, MIDDLE JUST RIGHT, RIGHT TOO HIGH.
(Courtesy of "Better Fruit.")

SECRETARY'S SYNOPSIS OF 1910 MINUTES.

JOSIAH W. PRICKETT.

The Committee of Arrangements have thought it would be of interest to this convention to have pass in review some of the more important work of this Association during the past year. This will include the deliberation of twelve regular meetings. At some of these meetings, however, a large portion of the time was taken up with routine business, which will be omitted in this paper.

December Meeting (1909).

At the December meeting 1909, the subject considered at length was "The Cultivated Orchard" vs. "The Uncultivated and Indifferently Mulched Orchard." The testimony was pronounced in favor of thorough cultivation. Another fact emphasized, that large apples are demanded by the markets. Such fruit can be produced by thorough work in cultivation, spraying, trimming and thinning.

January Meeting.

The January meeting was made profitable by going over in review the proceedings of our recent convention.

February Meeting.

February meeting. Our delegates to State Horticultural meeting came to us with an instructive report. Among other things, we were advised to feed our fruit trees all the plant food they can use at blossom time. We were, also, advised to make ourselves better acquainted with what is in the soil below plow depth. For those wishing to start asparagus, the Palmetto variety was recommended. Transplant the plants at one year old, using only strong plants. We were to be congratulated on our fruit exhibit, but were cautioned by our delegates not to use same fruit for more than one exhibit. At this meeting information was furnished showing the possible crops the railroad will be called upon to move in the near future. A transportation committee was appointed with instructions to wait upon the railroad management and bring to their attention the necessity of liberal siding and car accommodations.

March Meeting.

The March meeting was held at Arendtsville. The Lafean Apple Package and Grade Bill was discussed and explained by the corresponding secretary. The question was asked, in view of the fact that we are confronted with so many enemies to the peach, is it advisable to keep on planting, commercially? The meeting concluded that, with the present means at our command for fighting these enemies, we are justified in planting, and by the proper use of this fighting machinery, might expect profitable returns. Select high ground and tree free of Yellows, and plant not less than 16 feet apart.

April Meeting.

R. M. Eldon, as one of the delegates to the hearing on the Lafean Apple Package and Grade Bill, before the House Committee on Agriculture at Washington, called attention to several reasons why those favorable to the bill failed to secure affirmative action by the committee. The most conspicuous being the presence on the bench, of a member from Oregon, who, because of the necessity of facing his constituents next fall for re-election, was naturally a vigorous advocate of Oregon's opposing position. Oregon's principal objection to the bill is based on their desire to force the consuming public to accept their box, which is practically a Winchester bushel, as being a legal heaped bushel of apples, which is, of course, an absurdity.

May Meeting.

Small fruits came up for discussion at this meeting. A member called attention to a seedling strawberry he is growing successfully, it being the result of a cross pollenation between Gandy, Sharpless and Lawver. The varieties recommended for a succession are as follows: First, the seedling Lawver; second, Senator Dunlap, followed by Glen Mary, Oswego and Nick-Ohmer.

For blackberries, first, Early Harvest, followed by Blowers. Both are early bearers and the Blowers is a very large, sweet berry. In regard to raspberries, success has been had with Gregg and Mammoth Cluster varieties. Set plants three feet apart, in rows five feet apart, cut off tips of new growth, thus encouraging stocky growth, remove all old canes as soon as fruit is harvested, give thorough cultivation and thin canes in the fall

Several members mentioned the susceptibility of currants and gooseberries to the attack of San Jose scale and the great difficulty of eradicating it.

A discussion on plums brought out the fact that the reason that the Red June plum does not bear is on account of its imperfect blossom, which can best be remedied by interplanting with the Wickson variety.

In considering the advantage in spraying for coddling moth while apples were in full bloom, results both here and in New York, where it has been practiced, indicate that there is nothing gained by this practice, very favorable reports come from the use of Lime-sulphur as a summer spray when used in proper proportions, which is about 3 gallons Lime-sulphur to 100 gallons of water. Though, where more than one application was made, some burning of the foliage was noticed.

June Meeting.

Plant diseases were discussed at the June meeting. One member referred to the small amount of fungus trouble apparent this spring even where no spraying has been done, probably due to cold weather. Another member has noticed quite a good deal of Frog-eye fungus on his trees, even where they had been well sprayed with Pyrox. Attention was called to the fact that at a recent convention, especially of nurserymen, there has been a tendency to minimize the danger from root gall, but it was the testimony of growers present that on examining trees in their orchards that seemed to be in a weak condition, as shown by foliage, in almost every instance such trees were found to be affected by crown gall, and, even if it does not actually kill the trees, it seems to have a weakening effect, and it was concluded best not to deliberately plant trees so affected.

The necessity for selecting bright, new, Crimson clover seed, for planting, was emphasized, one member stating that he would rather pay several dollars per bushel more for such seed than for that which had been carried over.

July Meeting.

Handling of the peach crop was under consideration at the July meeting; first, as to thinning, Geo. Oyler opening the subject by saying that he thinks it pays well to thin but says his trouble is, usually, not to get them thin enough. Mr. Myers, of Bowmansdale, would measure with the eye about what a limb will stand and thin accordingly. Second, as to package, the meeting concluded that it was a good thing to put fine fruit in small packages, but the canning trade preferred half-bushel baskets.

Third, as to picking, packing and grading, Mr. Myers would make two or three pickings to a tree, and recommends leaving the fruit in picking baskets to be transferred to packing house. In grading, recommends usually two grades, never more than three.

Fourth, as to marketing. In discussing this phase of the business it was thought well for the producer to keep as near consumer as possible. In many cases better net returns being realized by selling right out of the orchards to hucksters and consumers.

October Meeting.

The question as to what receptacle we shall use in picking apples received considerable attention. It was the impression that the ideal method was yet to be discovered. There were advocates present of both the basket and bag-hung-on-the-shoulder method, but it was concluded a good compromise might be had by picking in baskets the fruit obtainable from the ground and step-ladders, and using the bag for high climbing. A careless operator will bruise the fruit by any method.

November Meeting.

Growers prefer a three-leg step-ladder for picking all fruit that can be reached in that way, and a straight ladder with pointed top for higher trees. The packing of the fruit by the growers, under supervision of the buyer, instead of by packing gangs organized by the buyer, was strongly urged by several members, so that all crops may be picked and packed directly into packages instead of placing on ground, or allowing to hang beyond the proper time, as is often necessary when waiting for packing gangs. All members who have not already done so, are urged to perfect themselves in this work, so as to take care of their fruit at the proper time without loss.

Packing Fine Adams County Apples.
(Mammoth Black Twig.)

LIME-SULPHUR PREPARATIONS FOR THE SUMMER SPRAYING OF ORCHARDS.

W. M. Scott, *United States Department of Agriculture.*

I. Dilute Lime-Sulphur Solution for Apple Diseases.

Bordeaux mixture has been the standard fungicide for the control of apple diseases since spraying apple orchards came into vogue. It has made profitable apple growing possible, where it would otherwise have been a failure, and has been the means of untold wealth to the commercial apple growers of the country. It has formed practically the sole remedy for apple scab, bitter rot and various apple leaf-diseases, and has been universally used on grapes, potatoes and other crops. In recent years, however, there has developed a very serious objection to the use of Bordeaux mixture as a fungicide on apples owing to the injurious effect it produces on both fruit and foliage. The fruit of many varieties like the Ben Davis and Jonathan becomes russeted and often dwarfed and distorted from the toxic action of the copper in the Bordeaux. This injury is produced mainly by the applications made within three or four weeks after the blossom petals fall and is especially serious in a wet spring. Mid-summer or late spraying, such as is required for bitter rot, rarely russets the fruit, the skin at that time having become tougher and more resistant. The skin of the young fruit is injured by the copper and as the apple develops, the injured portions enlarge, resulting in russet blotches and streaks. In wet seasons the russeting of the fruit is sometimes so serious as to reduce its market value twenty-five per cent., or in some cases even fifty per cent.

The pathologists and apple growers have, therefore, been driven to seek a less caustic fungicide and the result has been the development of various lime-sulphur preparations. During the past four years the Bureau of Plant Industry, and some of the Experiment Stations, have been conducting experiments with lime-sulphur fungicides and the results have been such as to warrant the recommendation of dilute lime-sulphur solution as a substitute for Bordeaux mixture in a large part of the apple spraying operations.

The Lime-Sulphur Sprays.

For two or three decades a preparation known as the lime-sulphur wash has been used in the dormant season for the control of the San Jose scale and other scale insects. It has been known for years that the same spray applied to peach trees in the early spring two or three weeks before they bloom would prevent peach leaf-curl and it is now a common practice to spray for scale and leaf-curl at the same time using the lime-sulphur wash. The lime-sulphur solution, now rapidly coming into use as a summer spray for apples, is only a modification of the old lime-sulphur wash.

Home-made Lime-Sulphur Solution.—Concentrated lime-sulphur solution to be diluted and used as a summer spray on apples may be prepared as follows: Boil 16 pounds of sulphur and 8 pounds of lime with 10 gallons of water for about an hour, finishing with 8 gallons of concentrated solution. Then strain and dilute it with water to make 200 gallons of spray. This makes 4 pounds of sulphur in each 50 gallons of spray, which, in our experiments, has proved to be about the right strength for summer spraying of apples. It may be made in larger quantities by using 100 pounds of sulphur and 50 pounds of lime and boiling them together with enough water to finish with 50 gallons of concentrated solution. The boiling may be done in a kettle over a fire, or in a barrel or other tank with steam. In diluting for summer spraying 2 gallons of this solution should be used in 50 gallons of water. Used at this strength in our experiments it controlled apple scab, leaf-spot, and cedar rust, fully as well as Bordeaux mixture, without seriously injuring the fruit or foliage.*

Commercial Lime-Sulphur Solution.—A number of manufacturers are now placing on the market concentrated lime-sulphur solutions to be used as a fungicide and an insectitude. Most of these preparations test 32° to 33° on the Baumé hydrometer and contain in solution about 2½ to 2¾ pounds of sulphur to each gallon. They are practically the same as the home-made solution, but are a little more concentrated and therefore require more dilution. A strength of 1½ gallons of the solution to 50 gallons of water gives about 4 pounds of sulphur in each 50 gallons of spray, and produces the same results as the home-made solution diluted to contain the same amount of sulphur.

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*For further information in regard to the preparation of concentrated lime-sulphur solution see bulletin No. 99, Pennsylvania Agricultural Experiment Station by Prof. John P. Stuart.

We have experimented with several different brands of these commercial products and have found very little difference in them. All that were tested gave fairly uniform results and compared favorably with the home-made solution. It appears, therefore, that, except in the matter of cost, it makes very little difference whether the preparation is purchased from the factory or made at home. The home-made product is less expensive but more troublesome.

Results of Experiments.

Experiments comparing the lime-sulphur preparations with Bordeaux mixture in the treatment of apple diseases have been conducted by the Bureau of Plant Industry in Virginia, Michigan, Nebraska, Missouri, and Arkansas. Excepting bitter rot and blotch, all diseases of the fruit and foliage in all the experiments were as thoroughly controlled by the lime-sulphur solution as by the Bordeaux mixture. The lime-sulphur produced very little or no russeting of the fruit and no serious foliage injury while the Bordeaux injured both fruit and foliage of Ben Davis, Jonathan, Yellow Newton, and some other varieties. The lime-sulphur sprayed fruit was invariably superior in appearance to that sprayed with Bordeaux.

Experiments for the control of apple scab on Winesap were conducted in Virginia during 1909 with the following results: On the plots sprayed with lime-sulphur solution less than one per cent. of the fruit was affected with scab; on that sprayed with Bordeaux mixture about two per cent. of the fruit was affected; and on the check or unsprayed plot thirty per cent. of the fruit was scabby.

During the same year similar experiments were conducted in Michigan with like results. The scab was held down to four per cent. of the crop by the lime-sulphur solution and to three and one-half per cent by Bordeaux mixture, while eighty per cent. of the unsprayed fruit of the same variety (Wagener) was affected.

Results of experiments conducted in Arkansas by the Department of Agriculture were not favorable to the lime-sulphur solution in the control of bitter rot and apple blotch. These two diseases were checked by the spray but not thoroughly controlled. There is, therefore, some doubt as to the efficiency of the lime-sulphur solution as a remedy for bitter rot and blotch.

In both the Virginia and the Michigan experiments the commercial lime-sulphur solution at a strength of 2 to 50 slightly scorched the leaves particularly on the terminal shoots, but this did not prove to be serious and at the end of the season the foliage was in good condition, the apple leaf-spot having been controlled and the cedar rust held in check. It was found also that arsenate of lead used with the lime-sulphur solution did not result in injury to fruit or foliage and that it controlled codling moth as thoroughly as when combined with Bordeaux mixture. A full account of these experiments was published in Circular No. 54 of the Bureau of Plant Industry.

Experiments of 1910.

During the past season experiments were conducted at Waynesboro, Va., on Winesap, York Imperial and Ben Davis. From 75 to 200 trees of such variety were sprayed and a check of about ten trees of each variety was left unsprayed. Each variety was divided into 4 plots and treated as follows:

Plot 1. Commercial lime-sulphur solution, 1½ to 50, with 2 lbs. arsenate of lead.

Plot 2. Home-made lime-sulphur solution, 2 lbs. of lime and 4 lbs. sulphur to 50 gals. water, with 2 lbs. arsenate of lead.

Plot 3. Bordeaux mixture, 3 lbs. bluestone and 4 lbs. lime to 50 gals. water, with 2 lbs. arsenate of lead.

Plot 4. Check, not sprayed.

The Winesaps were sprayed, (1) after the cluster buds opened, just before they bloomed (April 5); (2) as soon as the petals fell (April 19); (3) three to four weeks later (May 17); and (4) nine weeks after the petals fell (June 26). The Ben Davis and York Imperial received only three treatments, the first application given the Winesaps having been omitted from these varieties, for the reason that in Virginia they do not suffer seriously from attacks of scab.

Effect on the Foliage.—The weather was unsually cold and wet during April and May and the conditions were favorable for spray injury. Toward the end of May, soon after the second spraying of the Ben Davis and Yorks, the leaves of these varieties showed considerable spray injury on all the plots. On the lime-sulphur plots the leaves of the young shoots were somewhat scorched around the margins, and as a consequence, some of them were crooked or curled. A few dead spots appeared on some of the leaves and at that time it looked as though the injury might prove serious. It did not progress any further, however, even after the next application, and the trees soon grew out of it. By mid-summer nearly all evidence of injury had disappeared and during the remainder of the season the foliage was in excellent condition. In respect to injury there was practically no difference between the home-made and the commercial lime-sulphur.

Bordeaux mixture caused more injury than either of the lime-sulphur perparations and this injury increased as the season advanced. The leaves were more or less spotted with circular, brown areas and a considerable percentage of them turned yellow and dropped off. The trees sprayed with the lime-sulphur solutions went through the season with much better foliage than those sprayed with Bordeaux mixture, demonstrating the superiority of the former fungicide over the latter in this respect.

The apple leaf-spot disease was controlled equally well by both fungicides and about the same was true of cedar rust. The lime-sulphur solution, however, showed some superiority over Bordeaux in controlling cedar rust. This disease seems to yield more readily to sulphur sprays than to copper sprays.

Effect on the Fruit.—There was practically no difference between the lime-sulphur solution and Bordeaux mixture in the control of the diseases that occurred on the fruit. Apple scab, fruit spot and sooty blotch were controlled equally well by both fungicides. In the case of the Ben Davis, particularly however, there was a decided difference in the appearance of the fruit sprayed with the two kinds of fungicides. The fruit sprayed with Bordeaux was russeted considerably, although very little of it was dwarfed or distorted as often occurs with Bordeaux sprayed fruit. The Winesaps were also russeted but not so much as the Ben Davis, while the York Imperial showed only a slight roughening of the skin. The latter variety is almost immune to Bordeaux russet.

The fruit of all varieties sprayed with the lime-sulphur solution was almost free from spray russet. The natural russet at the stem end was enlarged slightly and on some specimens this ran over on to the side of the apple, but as a rule, the fruit was smooth, clean, and highly colored. The high color and general appearance of this fruit would place it in a grade higher than that sprayed with Bordeaux which would mean 25 cents to 50 cents a barrel in price.

The Control of Apple Scab.—In order to determine the comparative efficiency of the sulphur and copper sprays in the control of apple scab, the fruit from four Winesap trees in each plot and six check trees were sorted and the results, in terms of percentage of fruit affected with scab, are given in the following table:

Table 1.—Lime-sulphur solution vs. Bordeaux for apple scab.

No. of Plot.	Spray Mixture Used.	Per cent. of scabby fruit
1.	Commercial lime-sulphur solution (1½ to 50) plus 2 lbs. arsenate of lead.	2.2
2.	Home-boiled lime-sulphur solution (2-4-50) plus 2 lbs. arsenate of lead.	6.1
3.	Bordeaux mixture (3-4-50) plus 2 lbs. arsenate of lead.	6.2
4.	Check, not sprayed.	99.8

It will be seen from this table that the home-made lime-sulphur solution and the Bordeaux mixture both held the scab down to about 6 per cent. of the crop, while practically all of the unsprayed fruit was scabby. The plot sprayed with the commercial solution had the lowest percentage of scabby fruit (2.2 per cent.), but this was probably due to a difference in the plots and not in the fungicides. Plot 1 contained medium sized trees easily sprayed, while the trees in plots 2 and 3 were large and rather difficult to spray with the outfit used.

It would seem from these results and those obtained in previous experiments that the efficiency of the lime-sulphur solution as a remedy for apple scab could no longer be questioned.

Adoption of Lime-Sulphur in Virginia.

As a result of the experiments conducted in Virginia during 1909, by the Bureau of Plant Industry, practically all of the Virginia apple orchards were sprayed with the lime-sulphur solution during the past season. We personally examined some of these orchards and have had reports from many of them. In every case, so far as we have been able to ascertain, the results were satisfactory both as to the control of diseases and as to the effect of the spray on fruit and foliage. In the early part of the season there were a number of reports of injury to the young leaves, but in no case did this prove to be serious. In the Yellow Newton orchards where bitter rot is a serious factor, the lime-sulphur solution was used in the early treatments for scab and leaf-spot and this was followed by applications of Bordeaux for bitter rot. This plan was entirely successful, the russeting of the fruit having been avoided and the bitter rot disease controlled.

Conclusions and Recommendations.

The evidence obtained from various experiments conducted by the U. S. Department of Agriculture, and several of the experiment stations, seems to warrant the following conclusions:

Bordeaux mixture often russets the fruit and injures the foliage of many varieties of apples and its use in the early part of the season should therefore be avoided as much as possible.

Lime-sulphur solution, diluted so as to contain four pounds of sulphur in each fifty gallons of spray, is a good substitute for Bordeaux mixture in the treatment of apple scab and some other diseases, and will not materially russet the fruit nor injure the foliage. The concentrated solution may be purchased from the factory and diluted at the rate of 1½ gallons to 50 gallons of water, or it may be prepared at home.

This fungicide will control apple scab, fruit spot, leaf-spot and cedar rust fully as well as Bordeaux mixture, but has not yet proved to be as satisfactory for bitter rot. Where it is necessary to spray for this disease, the early lime-sulphur applications for scab may be followed at the proper time with Bordeaux for bitter rot, thus avoiding the russet and yet controlling the rot. There is also some doubt about the efficiency of lime-sulphur in controlling apple blotch and where this disease is bad Bordeaux should be used.

Arsenate of lead may be safely and successfully used in combination with the dilute lime-sulphur solution for the control of the codling moth and other insects.

The course of treatment best suited to this section may be outlined as follows:

Use the commercial lime-sulphur at a strength of 1½ gallons to 50 gallons of water, or an equivalent strength of the home-made preparation, with the addition of 2 lbs. of arsenate of lead in each 50 gallons of spray. Spray the varieties subject to apple scab: (1) as soon as the buds have opened, just before blooming; (2) as soon as the petals fall, beginning when they are two-thirds off; (3) three to four weeks later; and (4) nine to ten weeks after the petals have been shed. The first application may be omitted from varieties like York Imperial which do not suffer seriously from scab.

Where it is necessary to spray for bitter rot the first three applications outlined above should be followed by two or three applications of Bordeaux mixture at intervals of two weeks, beginning about June 25 to July 1.

II. Self-Boiled Lime-Sulphur Mixture for Peach Diseases.

Owing to the susceptibility of peach foliage to injury by applications of fungicides, the peach grower has been practically powerless to combat the diseases affecting the fruit and foliage. The use of Bordeaux mixture has been frequently attempted and in some cases, especially in dry seasons, the results have been satisfactory, but as a rule the injury produced by this and other copper fungicides is so great as to prohibit their use on the peach.

The efforts of the United States Department of Agriculture, during the past few years, to develop and perfect a satisfactory fungicide for use on the peach during the growing season, have been crowned with unusual success. We have found that a preparation known as the self-boiled lime-sulphur mixture can be safely and successfully used on the peach for the control of brown-rot and scab or black spot. The mixture, when properly applied, controls these diseases almost completely and does not injure the fruit or foliage.

The experiments have been conducted in Georgia, Virginia, West Virginia, Arkansas, Missouri and Illinois, and in every case the treatment was successful. During the past year many fruit growers in Georgia, West Virginia, and other sections, sprayed their orchards with the mixture, and so far no adverse reports of results have been received. So far as it has been tried the treatment appears to have been universally successful in controlling both peach scab and brown-rot.

Arsenate of lead may be added to the mixture for the control of the curculio, which not only produces wormy fruit, but increases the brown-rot infections by puncturing the skin and opening the way for the fungus. This insect occurs in destructive numbers in nearly all eastern peach orchards and in most cases where spraying with the self-boiled lime-sulphur for scab and brown-rot is done, arsenate of lead should be added.

Preparation of the Mixture.—To prepare self-boiled lime-sulphur, use 8 lbs. of fresh stone lime and 8 lbs. of sulphur to each 50 gallons of water. In order to get good action from the lime the mixture should be prepared in rather large quantities, say enough for at least 200 gallons at a time, making the formula 32-32-200. Place the lime in a barrel or tub and pour on enough water to almost cover it, then add the sulphur. Stir thoroughly while the lime is slaking and add more water if necessary to make a creamy paste. The slaking of the lime and the stirring will make a good mechanical mixture of the sulphur and the lime, only a small percentage of the former going into solution. As soon as the lime is thoroughly slaked more water should be added to stop further chemical action, as there is some danger of dissolving enough sulphur to injure peach foliage. The mixture is then ready to be strained and diluted for spraying.

Outline of Treatment.—For the treatment of peach brown-rot and scab, in Pennsylvania and adjacent territory, the following is recommended: Spray the early varieties, like Carman, Hiley, and Champion, about a month after the petals fall, and a month or six weeks before the fruit ripens. Later varieties, as the Elberta, Smock, Salway, and Bilyeu, will usually require three applications for the best results: the first to be made a month after the petals fall, the second three to four weeks later, and the third a month to six weeks before the fruit ripens.

For the curculio, arsenate of lead at the rate of two pounds to each fifty gallons of self-boiled lime-sulphur should be used in the first application but not in the others. Where this insect is a serious factor, an application of arsenate of lead, two pounds to fifty gallons of water with two or three pounds of lime, to be made a few days after the petals fall, is recommended, but is probably not often necessary in this section.

Mr. Newcomer. Have you found 2 lbs. of arsenate of lead to control curculio on the peach?

Ans. A great deal of work along this line has been done, and as Mr. Scott recommends 2 lbs. I infer that it is the strength which he has found sufficient.

W. S. Adams. How Long will self-boiled lime-sulphur keep?

Ans. It will keep quite a long time. I do not know that the limit has been determined but it is several weeks, at least. It has been used several weeks after it was prepared and it was apparently in good condition. It should be kept in a closed vessel, on account of evaporation. At the strength referred to it will stand without crystalizing.

W. H. Black. Has the use of lime-sulphur been extended to potatoes?

Ans. Not to my knowledge. There is not the necessity for that as in the case of fruit trees. Bordeaux is effective in treating potato diseases and causes no injury.

Trinity of Successful Orcharding
FERTILIZE—CULTIVATE—SPRAY
—*Bailey.*

Picking Adams County York Imperial.
(Nothing but Fancy Fruit in Sight.)

SUCCESSFUL ORCHARDING IN VIRGINIA.

Hon. S. L. Lupton, *Winchester, Va.*

Mr. President, Ladies and Gentlement, members of the Adams County Horticultural Society:

If you will turn to your programs you will see that I have been invited to tell you about successful orcharding in Virginia and I desire at the outset to take exception to that title to the remarks I shall make.

I have come among you not to tell you of successful orcharding but to tell you of the mistakes I have made. I helped to plant the first commercial apple orchard ever planted in the Valley of Virginia and can therefore trace my mistakes from the very beginning of things horticulturally speaking.

I can tell you of these mistakes, however, with less shame and sorrow because if my contact with human nature has taught me anything, it has taught me that in spite of my advice and example you will probably go right on making the same mistakes I have made.

I feel really ashamed to tell you of the good results I have achieved when I have done so many things I should not have done and left undone so many thing I should have done. I fully expect you will buy poor trees because they are cheap, as I did, and I have not much doubt but that most of you will select the poorest field on the farm for an orchard as I did.

Then in all probability the cows and sheep will be turned into the young orchard as mine were, and my friends, of all the 57 different ways in which I have tried to kill apple trees the best is an old brindle cow costing about $30.00 and I expect most of you have that kind. Your country here in Adams county looks very much like ours in the Valley of Virginia and therefore I must presume that your problems are very near the same as our own, especially so as most of the Valley of Virginia was originally settled by people from Pennsylvania, and you will be surprised to know what a fine upstanding fellow a Pennsylvania Dutchman makes after he has lived in Virginia a hundred years or so.

We will suppose, if you please, that some of you are about to start an orchard, and let me preface my remarks by saying that I shall be glad to have you interrupt me by asking any question that happens to come into your mind while I am speaking. Let us suppose then that some of you are about to plant an orchard the first consideration should, of course, be the location and on that point I would recommend you very earnestly to secure the expert advice of Prof. Gould of the Department of Agriculture at Washington, who is here with you to-day. Prof. Gould has spent many years in all parts of the country studying soil and climatic conditions with special relation to their adaptability for fruit growing and can therefore give you material assistance on the most important point of location.

In a general way select a site for the orchard where there is good soil and air drainage, particularly the latter.

If you plant fruit trees in a location where the night air lies still and sleeps, look out for frequent frost injury and all sorts of fungous diseases. I know, because that is one of the mistakes I made.

Plant on the best land you have that is suitable for the purpose —not the land you can best spare for the purpose or the land that is least useful for other purposes. If there is a real good apple orchard on real poor land I don't know where to find it.

After having selected your piece of ground, it becomes necessary to select the trees. My very strong advice is not to plant anything but good trees. The average farmer, who expects to be a fruit grower, had better plant the larger trees just because they are large.

C. J. Tyson. Which would you plant yourself?

Mr. Lupton. I am planting two year old trees. If you are going to specialize and make fruit growing your principal business, it is probably as well to plant the one year old trees, but not for the average farmer fruit grower.

C. J. Tyson. Won't we get better trees by planting yearlings?

Mr. Lupton. There is not enough difference so that you will notice it in three or four years. I have had no trouble in getting good stands with two year old trees.

E. P. Garrettson. Do we not get a better root start in yearling trees?

Mr. Lupton. That is largely a matter of opinion. I must confess that my success has been better with the larger trees. I have no very great preference but always plant two year olds. Most of us plant our trees a little too shallow. A tree should be planted to a considerable depth, as they have a tendency to make a deeper root system if so planted. I think that most of us are apt to hurry the job of planting trees. We do not do the work quite well enough. The question is, what is too deep? My practice has been to plant somewhat deeper than in the nursery, three or four inches deeper. My experience in planting Kieffer pears was one of the mistakes I made. I planted them too shallow. The roots grew above the top of the ground. The Kieffer pear is a tree that needs to be planted quite a little deeper than the apple, however. My own experience has taught me to urge deeper planting wherever it is possible to be done.

The actual selection of the trees is a matter of the greatest importance. The time was when we were very much afraid of a disease in the top of the trees. It seems to me we spent too much time and attention in examining the top of the tree and not enough to the roots of the tree. The root of the tree, being in the ground, is lost to sight and whatever is wrong with it is apt to stay wrong. Take extra pains in securing clean stock from the nursery.

How are we to tell whether the trees are sound or not? One of my mistakes was that I selected trees myself. I planted a lot of trees which I thought were healthy and had to dig them up. I would, therefore, again urge you to be extremely careful. The best way to bring about the selection of trees is through your organization, by paying some expert man to go to the nursery and see that you get good trees. That ought to be the fundamental principle of your organization.

W. C. Tyson. Before you plant them do you do any root pruning, and how much?

Mr. Lupton. The usual practice in our section, and my present practice, is not to prune the roots any more than can be helped. If there is a broken root cut that off, but they have usually been pruned sufficiently when taken out of the nursery. Prune the root as little as possible.

C. S. Griest. Do you use budded or grafted trees?

Mr. Lupton. I have never used budded trees. There is a wide controversy in the press and amongst nurserymen about piece root grafting and whole root grafting. The only difference so far as I can see is that the whole root has a longer piece than the piece root. My present plan is to buy the trees from the most reliable man I can find and then not to trust him for anything. Having planted the trees, it has been my custom of late, to prune them after planting, I think probably you can get at the tree for cutting back better and more intelligently after it is planted than before. I am speaking in reference to two year old trees. My observation and experience has been that you can make a better and quicker job of it. I prune them any time during the winter after fall planting.

W. C. Tyson. Do you trim them to a switch?

Mr. Lupton. I suppose I am something of a crank on the subject of trimming, have always been opposed to the too free use of a pruning knife. The pruning has to go until the limbs get to some size. I prune very little. I think possibly I have been too extreme on this subject of not cutting back the trees, but I have not yet gotten my own consent to cut back a newly planted tree to a switch.

I have great trouble in getting properly shaped trees from the nursery. That is one of the things that I do not know how better to express than to say it is simply a part of the game. There are two general theories, one a vase shaped and one a pyramid shaped tree. Make it the shape that will best suit the particular tree. Sometimes it lends itself more readily to one and sometimes to the other kind of trimming. I would prefer the Vase shaped if I had my choice. But, after all, the shape of the tree is not of nearly so much importance as some people seem to think. It is our practice, almost invariably to plant trees in the fall and to cultivate the ground in corn the following spring. I cannot see that this is seriously objectionable, but the question arises at once, what to do with that field after you have taken the corn crop off.

Mr. Cohill. How about crimson clover?

Mr. Lupton. I have tried sowing crimson clover, with only fair success.

C. J. Tyson. How about rye to turn down next spring?

Mr. Lupton. I have tried sowing rye, and that is better than anything else I have ever tried, only I turned it down too late.

Mr. Cohill. We are very successful with clover.

David Knouse. A number of our people have set out trees this spring and have it in corn, what would you advise to do with the ground next spring?

Mr. Lupton. I have just said that is the objection to putting corn in an orchard. Next spring I would advise cultivating that ground until perhaps the middle of June then sowing in cow peas or crimson clover. I am inclined to think what I would do in your case would be to break the ground next spring, cultivate it three or four or five times, to say about the middle of June expecting to get your cow peas well up by the middle of July.

After you have your orchard fairly started, there comes the question of pruning, spraying, etc. I think that is the time when perhaps the pruning ought to be attended to with the greatest care, when the tree is young. A great many of our fruit growers seem to think that an orchard does not need to be sprayed until after it becomes badly infested with scale or comes in to bearing. Trees ought to be sprayed annually whether they have any fungus diseases or not. We think we do not have any disease until all at once we discover our trees are covered with it. Fungus diseases, scale or cedar rust will come on young trees and retard their growth just as much as on older tree in bearing.

I would advise continual annual spraying after the first year, and perhaps the very first year.

W. S. Adams. How far apart do you plant them?

Mr. Lupton. Thirty-six feet usually. The first orchard I planted myself, the permanent trees were 36 feet apart and then a tree in the centre of each square, the middle or filler tree to be pulled out later. This plan turned out to be my salvation. I selected Winesap for a permanent orchard and Ben Davis as a filler, and later I cut the Winesap out and kept the Ben Davis. I would advise using fillers only under certain conditions.

This year I am planting some newer varieties, and planting them alternately as described. Am also planting some Stayman Winesap and some Jonathan. The Jonathan is a problem with us and I am using both Stayman and Jonathan now and shall determine in ten or twelve years from now which one to cut out. I have one block of trees in which the York Imperial is started for the permanent orchard and have 500 Duchess, 500 Grimes Golden, 500 Gano and 500 Wealthy planted in with the York Imperials, as fillers. I may conclude to take out the York Imperials and leave some of the Duchess. I am hoping, however, to get a few crops before I have to take either of them out, and will decide then which to leave. There are quite a few of our growers planting in that way and I am inclined to think it is a pretty good plan.

The trees, with us, come into bearing, so that it is worth while to consider the crop, at 7 or 8 years, and, in the meantime, we must spray annually for fungus diseases of various kinds. I have never tried to make my own lime sulphur. I am aware that in buying the concentrated Lime-Sulphur it costs me a little more, but until this fall I have not lived on my farm, and have depended on a foreman, and it seemed to me that he had his hands full and if I stopped him to make the solution he would lose a great deal of time when he ought to be spraying. A great many of our growers have made their own solution but the result has not always been satisfactory, and my notion is that the making of these spraying solutions is a much more delicate task than we think it is. Up to this time I have never tried it. I have used the concentrated Lime-Sulphur and shall do so again this year.

I am using compressed air for a spraying power and while it is perhaps the most expensive outfit I could select, I think it the best and therefore cheapest in the long run. I have a water supply that is very satisfactory. Both of our orchards were known in our country as dry farms, that is with no running water available for spraying. I bored one well 180 feet and one 135 feet and have been able to use the compressed air for pumping the water as well as for spraying the trees. The compressed air pumps the water at the rate of 60 gallons a minute. I have the same kind of well on each place. The spray tank holds from 135 to 140 gallons. The air tank and spray tank, both same size, lay on the wagon like two logs, and are bolted down to a frame which fits on an ordinary farm wagon. I spray with a pressure of 100 pounds, and anywhere from that up to 200 pounds when the tank is full.

C. J. Tyson. Can you control that pressure?

Mr. Lupton. Without any trouble whatever. The man on the wagon has no trouble at all in controlling the pressure. We spray with approximately 100 pounds. I have six of those outfits and use six two-horse teams, and twelve men can keep five teams spraying all the time.

Mr. Cohil. Do you prefer compressed air to gasoline engine outfit?

Mr. Lupton. I have never used the gasoline engine outfit. Some of my neighbors have and the majority of them have had more or less trouble.

W. C. Tyson. What horse power engine do you have?

Mr. Lupton. I have an 8-horse power engine that I use to cut hay, straw, fodder and wood, and do the farm work and use this same engine for spraying.

J. W. Prickett. How long does it take to charge the tank?

Mr. Lupton. It takes about seven minutes to load up the tank. I have been able, on one or two occasions, to get over my orchard of 300 acres, in about seven days, and that seems to me the full limit of time that I can afford to take for it.

Dr. Stover. How many gallons do you require for your spraying?

Mr. Lupton. Really I could not say. I just keep on buying until I get enough. We spray out about 5,000 gallons a day, two leads of hose on each tank and one nozzle to each lead.

E. P. Garrettson. What nozzle do you use?

Mr. Lupton. I use the Friend nozzle, and yesterday I ordered some of the Bean nozzles to try. I could not tell you who makes these compressed air sprayers. I got the tanks from Chicago, the engine from your own state, at Erie. The hose and extension rods I got from Gould's, at Seneca Falls, just picked it up where I could get the best outfit. There is a pipe extends the whole length of the liquid tank, about eight feet long, through which the compressed air enters and you can hear it boiling all the time. I think our Martinsburg friends have been improving on that by using some kind of sprocket chain agitator.

J. W. Prickett.—Have you used self-boiled lime sulphur?

Answer. Not to any extent. Will try it more fully this coming summer.

Question. How large are your spray tanks?

Answer. About 140 gallons.

Mr. Lupton. I bought a small air compressor and found that it took me three-quarters of an hour to pump up the tank. It was an air pump and not an air compressor, and the back pressure tore it all to pieces so I got another and larger one.

E. P. Garrettson. Is the liquid you use for spraying hard on the tank?

Answer. No, I expected it would be but it has now been in use four years and the tanks are all right. They are made of galvanized steel.

E. P. Garrettson. Is not sulphate of copper hard on steel?

Mr. Lupton. I have used almost every thing—Bordeaux lime sulphur and arsenate of lead but the meanest thing I have to use is arsenate of lead and lime-sulphur.

E. P. Garrettson. Is 100 pounds sufficient?

Mr. Lupton. I think so. Maybe I did do a little better with a higher pressure, but I remember when we had the old-fashioned hand-pump and thought we were doing pretty well with probably not over forty pounds, and now we think we are not doing good work unless we are going a little higher than 100. One hundred is the best we can do with compressed air. That is the limit of the pressure.

E. P. Garrettson. Is it dangerous on that account?

Mr. Lupton. I have thought about that and talked about it to people that ought to know, and hardly think it is.

E. P. Garrettson. The trouble is we cannot see inside the tank to know how much it is rusting.

J. W. Prickett. What sized pipe do you use in your well?

Mr. Lupton. A 1¼ inch pipe. If you have proper conditions in a dug well it will answer the same purpose. I have had considerable trouble in getting water out of a deep well with an ordinary pump.

Mr. Cohill. Has your compressed air been entirely satisfactory?

Mr. Lupton. There is only one objection that I can see and that is the agitation. My friends at Washington asked me to send a sample from the tank when I first began to spray and another when it was nearly out, and they say there was no difference. The first two or three trees that are sprayed show an excess of lime. I called attention to this and they say there would naturally be an excess of lime which would come out first from the bottom of the tank and would do no harm.

J. W. Prickett. Do you think that comes from the Nozzle being clogged?

Mr. Lupton. No, when you first begin to spray you spray from the bottom. I try not to leave any liquid in the tank over night, so as to start fresh each morning.

E. P. Garrettson. Do you use Lime-Sulphur for scale?

Mr. Lupton. Yes. I bought an orchard a year ago very badly infested with scale and used oil on it twice and lime-sulphur twice. Used oil in the fall and lime-sulphur in the spring, and after two applications I got an expert to come up from Washington and ascertain whether he thought best to use another application of oil. He thought I had better try the oil one more time. The second year I used oil in the fall and lime-sulphur in the spring as before and can find no sign of scale whatever. I shall spray it thoroughly again this winter with lime sulphur as a precaution.

E. P. Garrettson. What brand do you use principally?

Mr. Lupton. I have been using the Thomsen Chemical Co.'s goods. I read a very interesting statement from Prof. Stewart of your state as to the affect of the summer spray of lime-sulphur in controlling scale, and I take it from that article that Prof. Stewart thinks that the summer spray of lime-sulphur will probably result in your being able to leave off the winter spray, perhaps two years out of three. That is my interpretation of his article which I hope may prove correct.

There is one other point about this qestion of fruit growing that is interesting and that is the selling of the fruit. If we do our duty and grow the right kind of fruit and put it up in the right way, it will sell itself. I don't believe we need worry about selling the fruit. Perhaps this branch of the subject can better be discussed under the head of organization. We are so bountifully blessed in this country both in locality, soil, climate and markets, that we have more than fair returns for our labor.

Another big thing that has always impressed me as being one of the chief values of fruit growing in this or other countries, is that it keeps the young men at home. It is sad to me to see a sturdy old farmer and his wife and hear them talk of their boy who has gone to the city. It has seemed to me that this development of fruit growing will keep the young men at home. Why not set apart a few acres on the farm for the boy's orchard and get him interested in fruit growing before he begins to think about going to the city.

W. C. Tyson. How about the packing, do you think we should use the box exclusively or the barrel, or both?

Mr. Lupton. This year there is something wrong about the box packing. The situation is a puzzle to me. I have been talking to everyone who would listen to me about boxed apples. For some reason, unknown to me, the boxed package seems to be having a hard time this winter. Just what this means I do not know. It may mean there was a larger crop in the Pacific Northwest than was expected. Certain it is we must get some better package than the barrel. We tumble the fruit into the barrel and roll it about and put a press on it and smash the apples all to pieces. We ought to have some better method than that. The labor question is a serious one with us and of course this has to be considered when deciding on the form of package.

Perhaps you can get labor better here in Adams County than we can but with us it would be impossible to secure enough labor to handle our crop in the time necessary.

This season I had over eleven thousand barrels to pick, pack and deliver, and the work had to be done in a month.

I have always been much in favor of the box package but I confess the situation this year has staggered me. I understand that this year many apples are being taken out of boxes and put in barrels, and I do not quite understand the situation. And then again while box apples are very low, barreled apples are higher than I have ever known them to be.

Mr. President, we fruit growers of the east are having a great opportunity and I believe are doing a great work.

Fruit growing is the highest form of agriculture and if properly and intelligently conducted will do much to put the profession of agriculture in its proper place among the arts and sciences.

I use the word profession advisedly, Mr. President, and would like to see every farmer and fruit grower regard himself as a profesional man, and insist that his profession be given proper consideration everywhere. Let us strive always to grow good fruit, pack it honestly and be sure it will bring a fair price in the market. I am very glad indeed, Mr. President, to have had this opportunity to meet with the Adams County fruit growers and would like very much to see many of you visit our own great Valley.

I feel that there is room enough for all in the fruit business and have no fear that it will be overdone.

Hoping to have the pleasure of another visit to your beautiful county I thank you for your very close attention to my somewhat rambling description of the way we do things in Virginia.

Williams' Early Red.
A very satisfactory Red Apple for early summer.

SOME SUGGESTIONS ABOUT THE MANAGEMENT OF ORCHARDS.

H. P. Gould, *U. S. Dept. of Agriculture*

In the management of orchards we like to think we are progressive and modern in our methods and up-to-date, blazing the way along new trails. For quite a good many years now I have been talking orchard management at horticultural society meetings and other similar places and I have been thinking all the time that I was advocating modern practices to meet modern conditions. However, listen to this: "But the misfortune is, that too frequently after orchards are planted and fenced, they have seldom any more care bestowed upon them. Boughs are allowed to hang dangling to the ground, their heads are so loaded with wood as to be almost impervious to sun and air, and they are left to be exhausted by moss and injured by cattle, etc."

Doesn't that sound very much like a description of some of the present day conditions? And again: "The feelings of a lover of improvement can scarcely be expressed on observing the almost universal inattention paid to the greater number of our orchards, and that people who go to considerable expense in planting and establishing them, afterwards leave them to the rude hand of nature; as if the art and ingenuity of man availed nothing, or that they merited no further care."

Verily, a repetition of much that is said about many orchards, of the present day. But if modern conditions are thus represented to any extent, somewhat ancient conditions are also portrayed in the same language for it is thus that old Bernard M'Mahon wrote more than a hundred years ago in his "American Gardeners' Calender" which was published in 1806. It is interesting to note in passing that this is probably the first distinctively American book relating to gardening and fruit growing that was published in this country.

The statements I have quoted above therefore apparently represent common conditions with reference to the orchards at a very early day. Unfortunately such conditions have persisted to a greater or less extent to the present time.

It necessarily follows then that there is nothing new or modern in the oft-repeated observations of the present day relative to our neglected orchards. There have been such orchards from the beginning and there doubtless will be such ones when the end of time comes.

I have been wondering a good deal lately what real progress we have made anyway in the management of orchards during the present period of rapid extension of the fruit industry.

Whatever other changes there have been, none are greater than the changes in the "point of view" regarding fruit production. And our present understanding of fundamental principles surely represents marked lines of advancement. Listen again to Bernard M'Mahon to show a contrast between some of the notions of a hundred years ago and present-day conceptions about the same thing: "When a tree has stood so long, that the leading roots have entered into the under strata, they are apt to draw a crude fluid, which the organs of the more delicate fruit trees cannot convert into such balsamic juices as to produce fine fruit." Even if the orchards of Bernard M'Mahon's day were representative in many respects of the orchards of our own time, the understanding of his time regarding the nutrition of the trees was indeed not the modern one. And we note a very marked advance towards what we believe is the truth when it comes to the matter of plant foods. Nearly 25 years later than the time when Bernard M'Mahon wrote—in 1829—Jethro Tull said, "It is agreed that all the following materials contribute in some manner to the increase of plants, but it is disputed which of them is that very increase of food. 1. Nitre; 2, Water; 3, Air; 4, Fire; 5, Earth." Further on in his argument this ancient writer states apparently to his own satisfaction, that it is in reality earth that is the true food of plants. And he says: "Too much earth, or too fine, can never possibly be given to roots; for they never receive so much of it as to surfeit the plant, unless it be deprived of leaves, which, as lungs should purify it." His philosophy of tillage was that it made the earth sufficiently fine so that the roots could take up and assimilate its very minute particles. In other words, as he viewed it the roots of plants literally ate up the earth when it was made sufficiently fine for them to do so. And no doubt these views represented the best information and thought of the times 75 and 100 years ago.

But we want to turn now to some of the more living issues. What I have said thus far, however, is by way of stating that in talking about the management of orchards here to-day I have no new story to tell and I don't suppose there is any originality in the manner of presentation. But if I can aid any of you in better understanding the *why* of things, or if I can help you to gain a better "point of view"—a better way of looking at things, my coming here will perhaps have been worth while.

The more I study orchard management, however, and the more I try to tell about it, the more I think there is in it—in the telling—a strong similarity to trying to tell how to choose a wife or when to spank the small boy. I should like some intelligent advice regarding the latter proceeding, myself, but somehow the things that work well in other cases fail flatly in my own experiences. That is just the way it is in managing orchards. No rule-of-thumb methods can be applied. What is good in one case is not necessarily good in another because of differences in conditions.

Right at the very outstart there are a number of important considerations in which great numbers of fruit growers fail. The American propensity for doing big things is at the bottom of one of the commonest failures and that is in planting too large orchards. The fruit growers of this country have become so fully imbued with the idea of quantity that in great numbers of cases he has lost sight of quality. Where this has occurred the grower, the consumer and the fruit industry have suffered. An orchard is too large when its extent precludes the possibility of applying intensive methods of management.

The average American fruit grower has been slow to learn the fact that quality of product should dominate every other consideration in fruit production; that just as soon as quality is sacrificed to quantity or to any other thing, all the interests concerned are made to suffer thereby.

In many cases of over-sized orchards the grower realizes that something is the trouble, but he fails to comprehend just where it lies. Or if he does understand it, he hasn't the nerver to apply the remedy.

Within the past few years certain sections in some of the Rocky Mountain and Pacific Coast States have become world-wide famous for their apples and other fruits. This fame has been built up largely an three practices; the intensive management of small individual orchards; the most skillful and business-like methods of marketing the fruit, thus making a reputation which is an actual cash asset; the united efforts of all parties interested including fruit growers, commercial clubs or other business organizations, railroads, and other agencies, not the least of which has been the real estate agent in everlastingly booming and advertising the particular sections in which they were interested—and then keeping forever at it. By these methods any good locality for the production of fruit may make a reputation which will be known wherever fruit is eaten. In some cases, however, so much noise about a locality or region has been unfortunate for it has been overdone.

Many of these western sections to which I refer and which are now known the country over, would be entirely unknown—some of them not even on the map—were it not for the application of just these methods I have named.

In the Grand Valley of Colorado there are relatively very few orchards of ten acres in extent; in the Hood River section of Oregon the same thing is true and it is freely admitted in that section that their success has come from the intensive management of small orchards—to which should be added, and it is no small factor, co-operative methods of marketing their fruit. But the size of an orchard, it should be added, ought to be measured by the size of the man back of it, not by a surveyor's chain.

Now to touch upon more concrete matters, there are one or two things I want to say about orchard locations, for there are many orchards throughout the country that can never be made successful because their location is so faulty. Not infrequently orchards are planted on a site that looks well but if the subsoil is examined a solid ledge of rock will be found perhaps three or four feet below the surface. Where this condition occurs an orchard is an impossibility under most conditions.

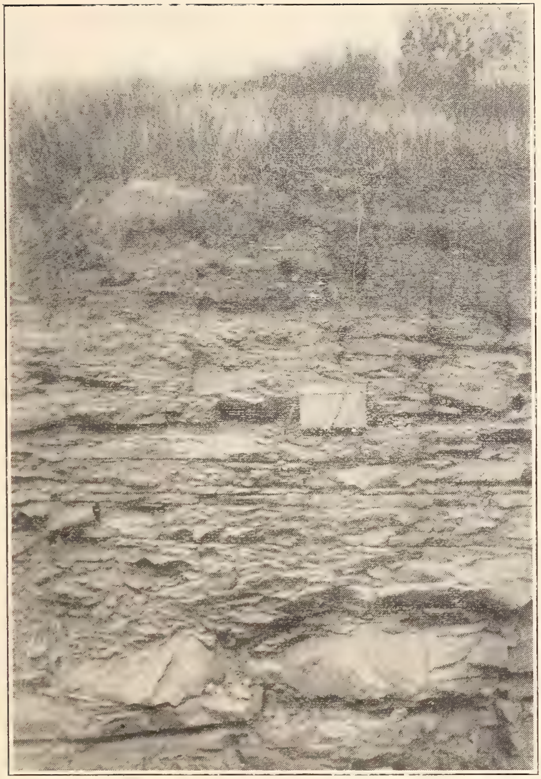

Fig. 1. Section of soil about three feet deep, underlaid by solid rock—a soil condition that should be regarded as "impossible" in selecting orchard sites.

Figure 1 shows a soil section that would appear well for almost any purpose in a moderately wet season but the rock stratum is entirely too near the surface for orchard purposes. Contrast this with Fig. 2 which shows a fairly porous subsoil and permits the easy penetration of the roots (a pine tree in this case) to almost any depth.

A more serious matter, however, because it is more common, is a location that is faulty from the standpoint of atmospheric drainage. The importance of a location having good air drainage has been made very emphatic in almost countless instances during the past few years. You know how cold air will settle to the lower levels. A very common observation in spring or fall is a killing frost in low places and none at all in elevated places. This simply means that the cold air which is heavier than warm air has settled to the low places crowding the warmer air up to a higher stratum. The result is the killing frost observed on low ground and the absence of it on high ground.

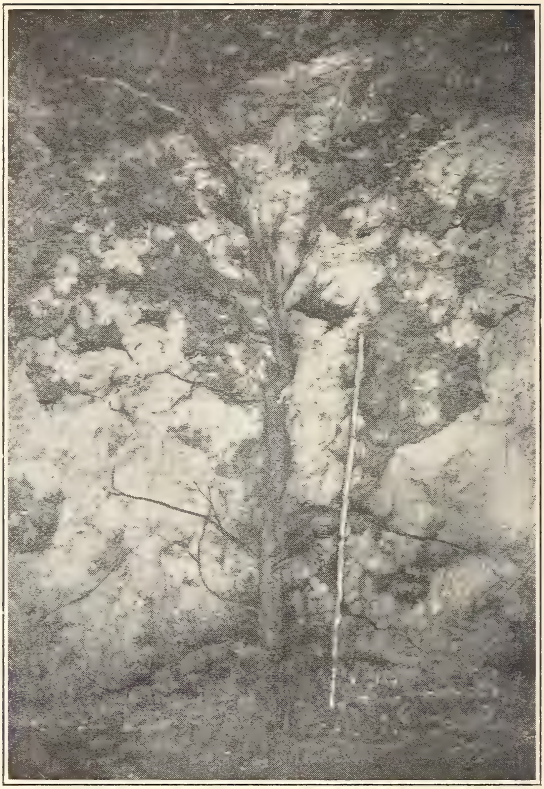

Fig. 2. A soil section showing a porous subsoil which may easily be penerated by the roots of trees (stick by side of root is five feet long.)

Practical demonstrations of the bearing which this has on successful fruit growing have been many times repeated during the past few years in the good crop of fruit on high ground and in the same localities their destruction by late spring frosts.

But I want to discuss very briefly some of the fundamental operations that make up "orchard management."

We think of orchard management as consisting of cultivation, fertilizing, pruning, spraying, etc., and perhaps we may come to add heating or smudging and other corresponding operations. But orchard management is really more than these things so far as results go for in the handling of every orchard there goes into it the individuality of the grower or manager—the "personal equation" and that is a most important factor in the behavior and success of every orchard. I am coming to put more and more importance upon "the man behind the tree." A man's orchard reflects his personality.

Taking up now some of these fundamental orchard operations, we perhaps may ask first of all: Shall we cultivate or shall we not cultivate? That is a very important question. Its correct answer all depends upon conditions. The man who believes in tillage says "cultivate." The advocate of the sod mulch method says "No cultivation" and there you are! Both may be right, both may be wrong; each one may be right and each one wrong part of the time. It all depends! It frequently is the case, however, that neither one knows just what he is accomplishing in terms of actual and ultimate results by the particular method he has adopted or is advocating. If he happens to be giving thorough cultivation, this is about what he is accomplishing by the operation: (1) improving the physical condition of the land; (2) conserving the soil moisture; (3) increasing the chemical activities of the soil.

The influence of tillage has been very adequately set forth by Prof. Bailey. I cannot do better than to quote him in this connection:*

> "1. Tillage improves the physical condition of the land.
>   (a) By fining the soil, and thereby presenting greater feeding surface to the roots;
>   (b) By increasing the depth of the soil, and thereby giving a greater foraging and root-hold area to the plant;
>   (c) By warming and drying the soil in spring.
>   (d) By reducing the extremes of temperature and moisture.
> 2. Tillage may save moisture,
>   (e) By increasing the water-holding capacity of the soil;
>   (f) By checking evaporation.
> 3. Tillage may augment chemical activities,
>   (g) By aiding in setting free plant-food;
>   (h) By promoting nitrification;
>   (i) By hastening the decomposition of organic matter;
>   (j) By extending these agencies (g, h, i) to greater depths of the soil."

To these effects of tillage there may also be added a secondary influence, namely the maintenance of the surface of the soil in such condition that it will readily absorb the water that falls on it as rain, thus reducing the "run-off" or surface drainage to a minimum.

It is probably within conservative bounds to say that the vast majority of orchards require, in the average season, for maximum results, all the benefits enumerated that can be supplied or enhanced by tillage.

But I suppose the advocate of the sod mulch system claims that he is accomplishing the same thing by his methods. It should be observed, however, thus early in the discussion that a great many who claim to practice the sod mulch system are doing nothing of the kind. They are simply not cultivating. They may even be harvesting a crop of hay from their orchards. But because it is in sod and they are not cultivating it—that to them is the sod mulch method. The sod mulch method implies a mulch—not a crop of hay. Of course there may be both but more often one of these things is at the expense of the other. You cannot use the grass that grows in an orchard for hay and leave it on the ground at the same time to decay and enrich the soil.

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*Principles of Fruit Growing, p. 139.

The sod mulch system, means that there must be a mulch. As practiced by those who are the most consistent in the matter, the grass that the sod produces is allowed to lie on the ground where it falls, or in the case of young orchards perhaps it is gathered more or less under the trees, to serve as a mulch to protect the soil form the excessive heat of summer, and, in time, to decay and become incorporated into it. Commonly the grass is cut two or three times during the season, especially if it is making an abundant growth. Frequently it is the case, especially after an orchard has reached considerable age and the ground becomes much shaded thereby, that there is not sufficient grass grown in it to supply an adequate mulch. What does he do in that case? If he is consistently following this system, he mulches his orchard without fail. But he hauls straw and other similar material into the orchard to accomplish the purpose. This may seem more or less visionary to some but the practice is a reality all the same.

The effects of tillage have already been enumerated. What of the sod mulch system—what is that accomplishing in comparison with tillage? Well, the mulch doubtless conserves the moisture to some extent so far as its evaporation from the soil is concerned because it serves as a covering for the soil if it is properly maintained. But on the other hand, granting that the mulch consists entirely of the grass grown in the orchard, the fact that it requires a vast amount of moisture to grow it should not be overlooked. In many cases this moisture might better be conserved for use of the trees. Then too, the mulch as it decays, works down to the surface of the soil through the grass stubble and becomes more or less incorporated into the surface, but it cannot be that the influence of its ameliorating effect extends into the soil to any considerable depth. Of course there is more or less decay of the fine hairy roots of the grass each year and in this way humus is added to a slight extent. But when we contrast the two methods—tillage and sod mulch—their influence so far as soil conditions are concerned appear more by contrast than they do in comparison one with the other.

No one would think of growing corn or potatoes or pumpkins in sod. So far as the philosophy of tillage is concerned, if it is good for corn or pumpkins, it is also good for apples. There are no essential differences between trees and the annual crops in the manner in which they live and grow. Experience, I think, fully demonstrates that this reasoning is sound; that tillage should be the rule and that when variations from the rule are made, it should be the sod mulch method that becomes the exceptional one.

It is true that many orchards which are given the sod mulch treatment, or even orchards used as hay fields, if you please, are measurably successful. But where such success appears to be marked and perhaps appears to completely vindicate the wisdom of the practice, it should not be forgotten that the measure of success that obtains may be in *spite* of the method rather than because of it. It is often surprising how much hard treatment a tree will withstand and still reward its owner with a crop of fruit!

Before leaving this matter of the sod mulch, however, I wish to add that it does, beyond any doubt whatever, have its place in fruit growing, especially in the case of apples and pears. With the latter, on account of blight, a rather slow, firm growth is desirable in contrast to a rapid succulent growth. The influences of tillage may easily induce the latter. And with apples, it does not necessarily follow that seeding the orchard down for a year or two at a time when cultivation is the rule is not often times of direct benefit. The thing to do is to cultivate for the sake of the trees, not for the sake of the cultivation and when the trees by their appearance and behavior cry "enough," then seed down for a year or two to clover or grass of some kind. Fortunate, indeed, is the man who is so expert at interpreting the appearance and behavior of his trees that he knows when to cultivate and when not to do so. But this constitutes one of the fundamental differences between fruit growers. Then, too, the topography of many sites well suited otherwise to fruit growing is such that continuous tillage is out of the question on account of the washing of the soil which would follow that practice. In such cases the benefits of tillage which might otherwise result advantageously must of course be foregone for obvious reasons.

But continuous tillage of an orchard year after year—that thorough tillage which means clean cultivation—will gradually work ruin to the physical condition of any soil because it means a continouous diminution in the supply of humus or decaying vegetable matter which is absolutely essential to its fertility. Clean tillage then must be accompanied more or less frequently with a green manure crop. Fruit growers and others have been slow to realize or to understand the importance of maintaining the humus supply of the soil. But gradually it is becoming appreciated. All over the country, even in the prairie sections where the exhaustless richness of the soil has been the boast for years past, the necessity of growing green manure crops is becoming apparent and the fruit growers are seeing its meaning.

As a rule some legume is desirable for a cover crop because of the nitrogen which it takes from the air and adds to the soil. In a cow pea country, perhaps, there is nothing better than this crop; but crimson clover, common red clover, vetch, etc., are frequently used. Among the non-leguminous crops used, rye is perhaps the most common. Buckwheat, rape and various other things are also of value.

These cover crops permit of tillage through the most important portion of the growing season, then following the cessation of that, perhaps in July, the cover or green manure crop is sowed.

Thorough tillage and the use of leguminous cover crops go a long way in maintaining the fertility of the soil in an orchard. Further than this I am inclined to pass over the matter of the plant food supply for the orchard. But I have ample justification in so doing for two reasons: Your own Agricultural Experiment Station is doing more in the investigation of these problems than any other institution that I know about. Preliminary results have already been published and are available in bulletins from your station. Then, too, enough has already been said to show that the "fertility question" of any orchard is a very local question and the only place it can be answered for any one of you is right in your own orchard. The bulletins of your station suggest how to go about answering such questions for yourselves. I therefore pass to the next fundamental tenet of orchard management—pruning.

Relatively, few orchards the country over, are properly pruned. In fact, a surprisingly large number are not pruned at all. It will help at the outset to have clearly in mind some of the more important reasons for pruning. They may be stated as follows:

1. To keep the trees shapely and within bounds.
2. To remove dead or interfering branches.
3. To make trees more stocky.
4. To thin the fruit.
5. To open the tree tops to admit air and sunlight.
6. To make thorough spraying possible.
7. To facilitate harvesting.
8. To reduce the struggle for existence in the tree tops.
9. To produce more fruit of better quality.

With this enumeration of the reasons for pruning I do not know that very much more need be said, though each reason given of course might be considerably amplified. If the truths contained in the several captions given are self-evident, as most of them must be, to take time to comment about them is to uselessly multiply words.

If a word of explanation is needed at all, it is in regard to Caption 8. Perhaps few realize that there is a struggle for existence going on in the top of a crowded tree top but such is the case. The fingers of one's hand are about as close together as they can well be but they are not in the way of one another and there is no struggle or competition going on among them for room or for food supply. Each has its own allotted amount which is sufficient. If one suffers for lack of nourishment or in any other way, all the others suffer with it. Not so in a dense tree top! Every limb and branch is competing with every other limb and branch, every bud with every other bud for room and sunlight and air and food. Often the struggle in this competition becomes so sharp that whole limbs die for lack of room and sunlight and plant food. The competition is a merciless one. Now if we keep the tops sufficiently thinned out, all is peace. There is no struggle to the death and as a result every bud has food enough to deposit within its folds a goodly supply besides making its normal growth; we have a well-fed tree and fruit buds strong and vigorous enough to withstand many vicissitudes of climate that would kill outright weaker buds.

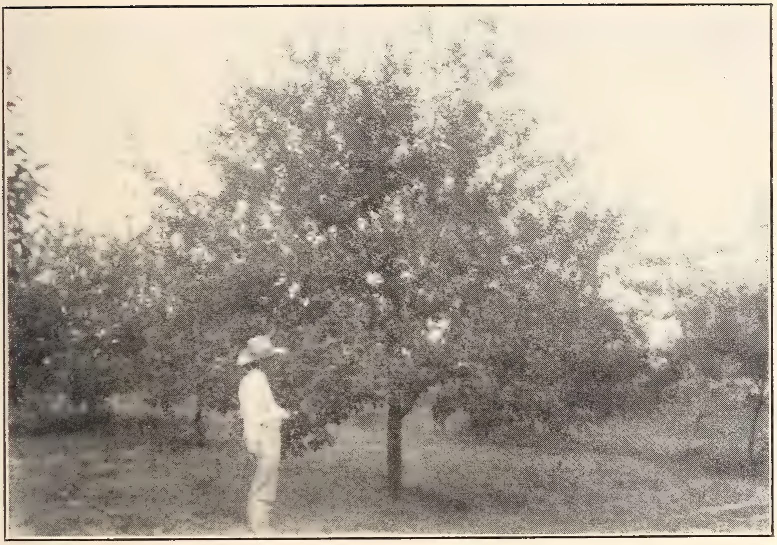

Fig. 3. Well pruned open headed Winesap—9 years old.

Figure 3 shows a tree that has been well pruned from the first. Its head is sufficiently open to admit air and sunlight, the tree can be thoroughly sprayed and the fruit harvested without the picker climbing through a pile of brush. Contrast this tree with the one shown in Figure 4 which is about 8 years old and has not been pruned since it was planted. Note the exceedingly dense head that admits neither air nor sunlight. And further, thorough spraying is a practical impossibility.

There is a great deal of difference in the habit of trees, and that is just where one of the difficulties comes in pruning. Every tree is a problem to itself. When it comes to spraying you can tell a man you want every part of the tree covered, and you can give him Rule of Thumb methods, and if he is willing to do as he is told, he ought not to have much difficulty in getting it accomplished. Not so with pruning, you must be on the job all the time.

Mr. Anderson. Is it not important to know how the pruning should be done? Would it not be unwise, for instance, to give the tree shown in Figure 4 too vigorous a pruning at one time?

Mr. Gould. Yes. It is a general principle in pruning trees that heavy cutting away of wood during the dormant season tends to promote wood growth while summer pruning tends to the formation of fruit buds. This should be kept constantly in mind. If a tree, such as is shown in Figure 4, is to be pruned to thin it out and to get it into a more desirable condition, it would be exceedingly unwise to proceeed with the idea of reducing the top to the desired extent at a single pruning. To do so would result in an excessive wood growth next season. At least two seasons, and perhaps better three seasons, should be taken in which to reduce the top of a very brushy tree to a proper condition. It is far better, however, to prune a little each year from the beginning, in which case no large amount of wood would need to be removed at any one time.

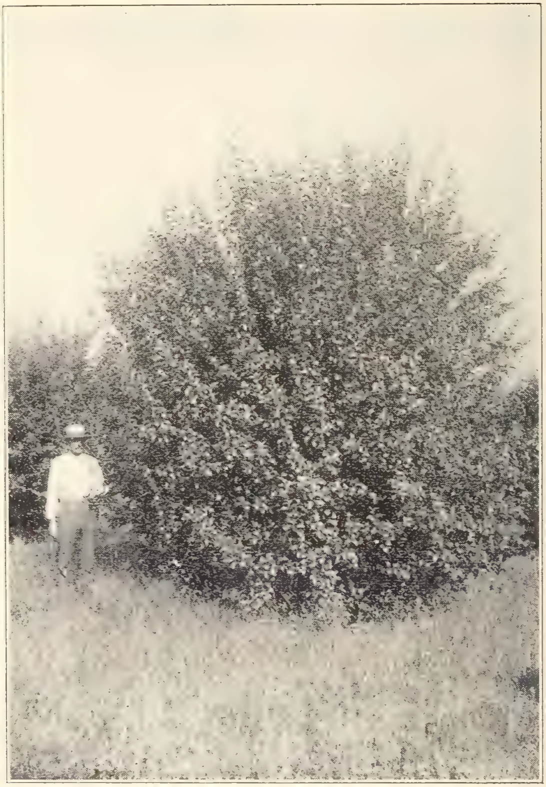

Fig. 4. Eight-year-old unpruned York Imperial Apple tree.

In one of the largest orchards out in Kansas, which is now 10 or 11 years old, the manager was only there once in a while, up to the time it was 8 years old, the work being in charge of a foreman. The results were not satisfactory and the manager made up his mind that he was going to make a success of that orchard if possible. The first thing he did was to begin pruning. He hauled out 4,000 loads of brush from 40,000 trees the first season. He found it would mean the cutting out of too much wood to shape the trees in one season. It would have meant the cutting out of one-third of the tops. The next year he hauled out 2,500 loads of brush. Year before last he was still continuing the pruning. After three years of pruning he thought he would be able to get his trees where he wanted them.

Mr. Newcomer. What was the result in fruit at the end of three years? Did it produce stronger fruit buds?

Mr. Gould. It is in a section that suffers from severe frosts, but this year, although they had only a partial crop, that orchard had more fruit than most of the neighboring orchards had. Its location, however, is a favorable one.

Mr. Anderson. I think it best to begin when the tree is young and keep at it.

Mr. Frazer. If Figure 4 had been forced to bearing early would it have become so thick?

Mr. Gould. Probably not.

Mr.. Frazer. If the soil had been impoverished the top would probably never have become so dense. Is it not a question of locality? Should this man, being located on excessively rich soil, be growing fruit, or should he be growing forest trees?

Mr. Gould. In pruning young peach trees, more or less heading back is generally practiced. This makes the limbs stocky and thus better able to hold up heavy loads of fruit. If no heading back is done, the limbs become long and "leggy" and are easily broken down with a heavy crop of fruit—to say nothing of the difficulties of gathering the fruit from trees that have been allowed to grow up into the air at will. I have a photograph here which shows a row of trees in one of the most successful West Virginia peach orchards. Trees were pruned in the spring and illustrate the point in regard to pruning where thinning of fruit is needed. It must be remembered that in the case of peach the fruit is borne on wood of last year's growth. In such pruning as suggested here it certainly does thin the fruit.

Mr. Frazer. Would you prune that way the first season and would you prune every year?

Mr. Gould. I would as a general proposition. There are a great number of conditions which are liable to arise from year to year which would make it advisable to omit a year. In this particular orchard owing to amount of pruning they have to do they must begin early in order to finish in time. If a very cold spell occurs while they are pruning the crews are taken out of the orchard until weather moderates and danger of killing buds is past.

Mr. Black. What part of last year's growth would you remove?

Mr. Gould. That depends on the vigor and amount of growth. It is not an infrequent practice to cut off half of it.

Robert Garretson. Would you thin out much in addition to cutting back?

Mr. Gould. These trees have been kept well thinned out. Keep a comparatively open head in order to give a chance for the sunlight and air to get in.

C. J. Tyson. I know that objections are raised many times to heading back, but what is the result if you do not head back?

Mr. Gould. By the time the peach tree is 10 years old it will be so slender that a light crop will pull it down. That is the way they develop in a great many cases.

Mr. Cohill. Would it be best to head back every year?

Mr. Gould. A very common practice is to keep that up until the trees comes into bearing.

Mr. Myers. Does not winter pruning tend to produce more wood growth.

Mr. Gould. Yes.

Mr. Myers. Then why prune to make more wood to cut out the next year?

Mr. Gould. That point was covered in my first reference to pruning. It makes trees more stocky and keeps them within reach for picking the fruit.

J. W. Prickett. Have you anything to say in regard to renewing a tree that has been split with too heavy a crop that was not thinned enough?

Mr. Gould. The first thing is to take the lesson of not thinning enough and thin more next time. After the trees have been broken down the only thing to do is to cut out the broken parts and get the trees shaped up for future usefulness.

In trimming care should be exercised to make the cut at the proper place. Much harm may be done by carelesss cutting. The cut should be made in a line parallel with the base of the limb.

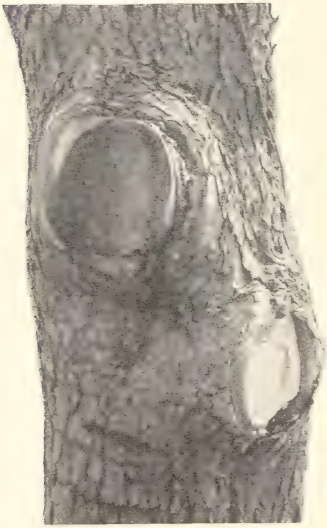

Fig. 7. Wound in center healing on left side; right hand side is too long to permit of healing. Lower wound was made close to trunk and is healing rapidly.

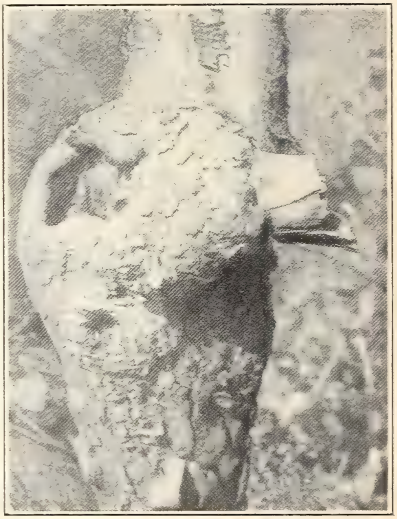

Fig 8. A long stub was left which could not heal over. The stub died and decayed, making the limb hollow. The stub at the right is adding to the trouble.

Figures 7, 8, and 9, show result of improper cutting. Such wounds will never heal over and finally result in permanent damage and even death of the tree. All large wounds should be kept painted to keep rain from soaking into the wood and when spraying with fungicides give these wounds a good soaking.

Mr. Cohill. What would you use for covering the wounds?

Mr. Gould. A good white lead paint.

Mr. Eldon. Is not red lead better. It sticks much better than white lead.

Mr. Gould. I am not familiar with it. The important point is to use something that will form a good covering.

If we knew more about what is going on in the soil, we would doubtless frequently be in a better position to decide how to treat our trees. We can see the tops of our trees but their roots are hidden from us. Figures* 5 and 6 are suggestive with regard to the root system of apple trees. Figure 5 indicates the mass of roots which comprise the root system of a 15-year-old apple tree, while Figure 6 gives an idea of their ramifications, the extent in this case being about 15 feet on one side of the tree and 18 feet on the other. It should be stated that these trees grew in eastern Colorado where the average annual rainfall is not over 16 or 17 inches. The moisture conditions may have had a marked influence in the formation of the root system.

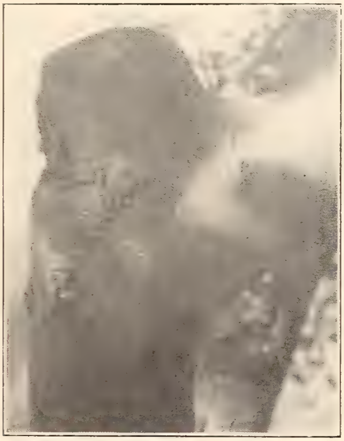

Fig. 9. The stub was left too long and has died. The wound can never heal. The stub will soon begin to decay and the limb become hollow thereby.

E. P. Garrettson. Would apple roots go as far as peach.

Mr. Gould. Yes, farther.

To make such a discussion as this complete of course it should include some reference to spraying but you have wisely provided for that as a subject by itself for discussion, hence it calls for no comments here, only to say that the developments in spray mixtures during the past two or three years mark an advance in orchard practice which perhaps means more to the fruit industry than any-

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*The photographs from which these illustrations were made were taken through the courtesy of the Colorado Experiment Station.—H. P. G.

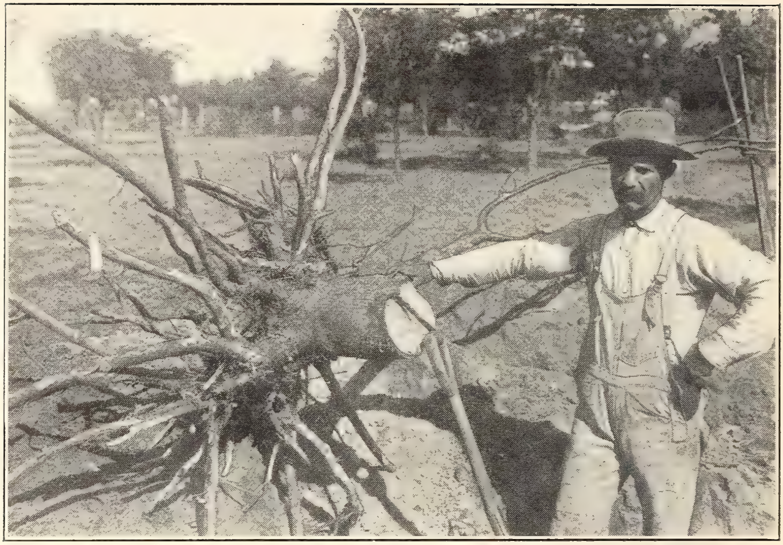


Fig. 5. Stump of Ben Davis apple tree, set shallow in 1895, showing mass of roots of 15-year-old tree.

thing else that has occurred since the value of fungicides and insecticides became fully recognized.

Another advance step which I believe will eventually be grouped with cultivation, pruning, spraying, etc., as an orchard practice is orchard heating or smudging to prevent frost injury. Great interest has been developed in this connection, many kinds of apparatus have been devised as means of applying or generating the requisite heat and smoke. While the practice must still be regarded as in the experimental stage, material progress has been made towards perfecting devices. When we know more about the range of possibilities and methods of working, it will doubtless be possible to formulate fairly definite plans of procedure.

It is now time to say that the production of good fruit does not consist in the tillage of the orchard, as important as that may be, or in fertilizing the soil well, nor in pruning, spraying, smudging, etc. But it does consist, other things being equal, in all of these various operations properly timed and adjusted to each other. Each one has its relationships to all the others. A break at any point in these relationships and a poorer grade of fruit is the result.

I am not supposed to say anything about the handling of fruit in the present connection, yet there is a pretty close connection between the production of it and its handling. There are only one or two observations that I care to make about fruit handling, and they are based on some of the experiences of some of my co-workers in the Department of Agriculture who have been working in California in connection with the fruit transportation and storage investigations of the Bureau of Plant Industry.

Four or five years ago the losses due to the decay of oranges in transit from California had reached such an enormous amount that it became alarming. The loss was variously estimated at from seven hundred and fifty thousand dollars to one million five hundred thousand dollars. The Bureau of Plant Industry of the Department of Agriculture undertook an investigation of the cause of this decay and the remedies. To make a long story, with many details, short, the chief cause of the whole trouble lay in the mechanical injuries which the fruit received while being handled between the time it was taken from the tree and the time when it was packed ready for shipment.

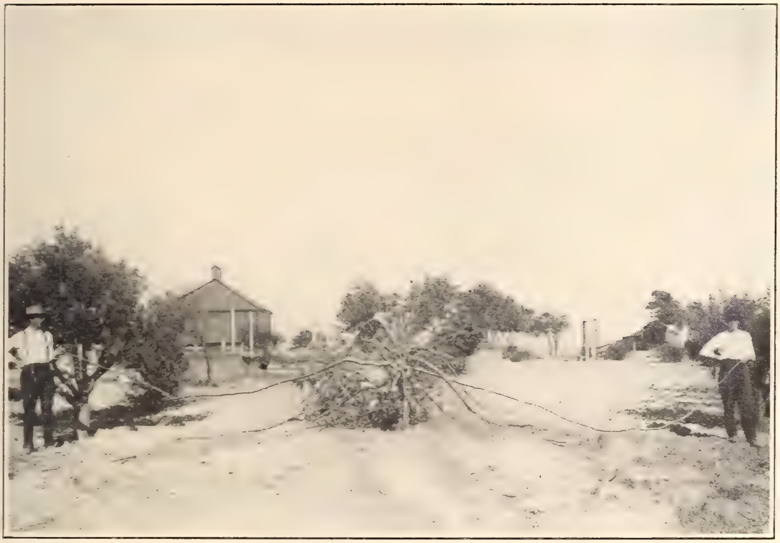


Fig. 6. Showing expanse of roots (15 feet one side and 18 feet the other side) of tree set deep in 1897. Tree 13 years old when dug.

The solution of the problem has been largely a thorough reorganization of methods of handling with a view to reducing to a minimum the mechanical injuries to the fruit. My reference to this matter is made because it touches upon one of the fundamentals of success. The careful handling of all fruit not intended for immediate consumption is a "permanent issue" among fruit growers and others who may be concerned. A fruit is a living organism. It breathes; it gives off carbon dioxide; it lives and dies and then decays. Any sort of treatment which in any way destroys or injures the cells of which a fruit is composed hastens its death and, by so much, induces decay.

In some cases it has been demonstrated that the mere dropping of an orange no more than twenty inches onto a hard floor results in a very material increase in decay in comparison with other fruit handled in identically the same way save for the dropping.

Of course the handling of citrus fruit as such, does not interest you in any way but if you grasp the principle involved you will see that the matter of extreme care in handling is not one of importance merely with citrus fruits but that it holds good for all fruits.

Now if in bringing my already too long discussion to a close there is one thing more than another that I wish to say it is to refer very briefly to the matter of co-operation among fruit growers. Almost every line of human effort is ahead of the farmer in having its co-operative organization for mutual welfare. From the Dagoes who attend to the street lights of our cities; from the Irish hod-carriers up to the most skilled artisans in the country, we find organizations that weld the members so that they can act as a unit and when one speaks it is the voice of authority for all. Among farmers, fruit growers are undoubtedly in the lead in this respect, but still there is relatively a small number of such organizations in comparison with their field of usefulness.

Some of the advantages of co-operation among fruit growers may be enumerated as follows:

(1). All supplies, such as packages, tillage implements and other tools, spraying material, spray pumps, fertilizers, and all other kinds of materials or equipment can be bought by the association in large quantities at wholesale rates and sold to the members practically at cost.

(2). The fruit being grown, picked, packed and handled in every way under the direction of the board of managers it is practically uniform in quality.

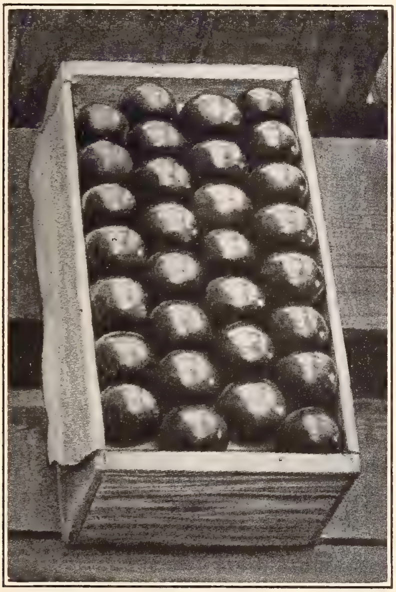
This makes it possible to standardize grades and to adopt brands that have a definite significance in the markets and an actual cash value in selling the fruit. It makes possible the building up of a reputation for a whole fruit section instead of for individual orchards as is generally the case otherwise.

(3). It is possible through the association manager to keep in the closest touch with market conditions and hence take full advantage of those conditions. The manager is usually the selling agent; hence the grower is relieved of the anxiety of dealing with fruit buyers when his whole attention is needed in the preparation of his fruit for market.

(4). Under these conditions quantity is not a factor in any individual orchard, as is often the case when a single grower must be able himself to ship in car lots. Quality becomes the aim. This makes possible small orchards or orchards of such size that the most intensive methods can be followed in the management of them. These are some of the more prominent functions of co-operative associations named without regard to their relative importance.

A very large proportion of the thirty thousand cars, more or less, of citrus fruits that are grown annually in California are handled by co-operative associations. Most of the fruit from Colorado, Oregon, Washington and other States of the Northwest is likewise so handled. You know something about the relative prices of this fruit in eastern markets in comparison with the prices that prevail for most of the eastern grown fruit. You have the advantage of the western growers in that they are so much further removed than you are from the large markets of the country. I doubt very much if the western fruit would reach the eastern market, at least not in large quantities, if it was not for the co-operation of the growers among themselves, working through their associations.

With the already important and the increasing fruit interests here in Adams county, I believe there is a grand opportunity for some very effective co-operation along the lines just mentioned. If such is the case, and you make the most of the situation, together with your possibilities for the production of high grade fruit, why cannot the reputation of the Grand Valley of Colorado, the Hood River section of Oregon, the Yakima Valley section of Washington, or of any other section be, in five years time and less, your reputation?



Celebrated Diagonal Pack. (Courtesy "Better Fruit".)

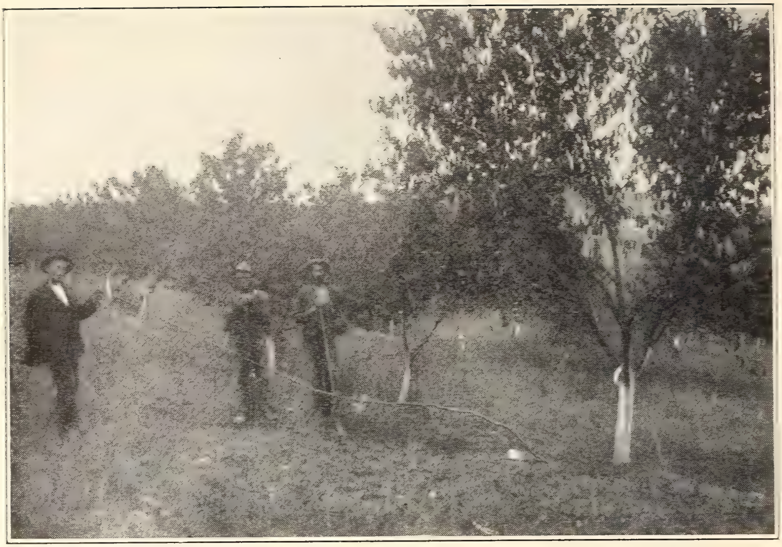


Fig. 10. Root of 5-year-old Peach tree, 17 feet in length, spread of branches about 18 feet, 9 on either side.

SELECTING VARIETIES, PREPARING THE LAND, AND PLANTING A COMMERCIAL APPLE ORCHARD.

J. Andrew Cohill, *Manager Tonoloway Orchard Co., Hancock, Maryland.*

Mr. President, Ladies and Gentlemen.—Your corresponding secretary has requested me to talk upon "Selecting Varieties, Preparing the Land, and Planting a Commercial Apple Orchard," and as representative of the Tonoloway Orchards of Hancock, Md., it affords me the greatest of pleasure to meet and talk to so many enthusiastic fruit growers, and to find many among you who have selected the same vocation as myself, namely; the culture of the "Fruit of Eden" the apple.

Apple culture is no longer a branch of agriculture where it so long languished; it has become the most important branch of scientific horticulture. As a result of the farmer's poor and neglectful methods, it is predicted that a few more years will see the total extinction of the small farm orchards as a business factor, and the survival only of commercial orchards, conducted according to modern horticultural methods. By this statement I mean only that the fruit grower, be he large or small, must use business and scientific methods in order to survive.

It is a well-established fact that the greatest success of commercial apple-growing depends upon proper selection and the planting of a few varieties only, taking into consideration not merely the present, but the future as well. This is the day of commercial orchards, and the first important stop after you have selected your land is to select you varieties. The selection of varieties has called forth the most painstaking consideration of every feature of growing and marketing by the best professional judgment of well qualified authorities and a close observation of actual results. The Agricultural Experiment Stations and horticultural authorities of the various states, as well as the Pomological Division of the U. S. Department of Agriculture at Washington have for many years engaged upon the highly important work of recording results obtained by different varieties of apples, in the various apple-growing sections, to determine the varieties best adapted to each locality. We made several mistakes in planting our orchards and I consider the selection of varieties the most serious one we made. Do not plant every variety of apples that your nursery may have in stock, or that every Tom, Dick and Harry recommends, for you will never have a commercial orchard if you do, but study and learn the variety best suited for your soil, climate and markets. I would be just as careful in selecting a good nursery before buying young stock. Decide upon what varieties you want, and then write your nearest reliable nursery, asking if they can furnish the varieties desired, and at what price. State the number of trees of each variety wanted, the age, and specify definitely that, under no conditions, will diseased or insect-infected trees be accepted, nor will substitutions of varieties be countenanced. Save the bill of sale for future reference, for the "Court of Appeals" in New York State has decided that nurserymen may be sued for damages resulting from the substitution of varieties. Go to the nursery yourself and inspect the trees, and insist on getting the varieties you have selected. I prefer a well-grown, one-year-old budded tree. A one-year-old budded tree may be headed low, and the first branches may be used for the foundation branches, selecting those best placed. Furthermore, a one-year-old tree is cheaper than a two-year-old.

The Tonoloway Orchard Co., of Hancock, Md., of which I am "field manager" of 350 acres, have 700 acres in apples or over 50,000 apple trees.

The following are the varieties planted:

1.	Yellow Transparent,	3,000
2.	Duchess of Oldenburg,	3,500
3.	Wm. Early Red,	1,000
4.	Red Astrachan,	600
5.	Summer Rambo,	1,000
6.	McIntosh,	300
7.	Wealthy,	4,000
8.	Jonathan,	6,000
9.	Yellow Bellflower,	1,000
10.	Grimes Golden,	7,000
11.	Winesap,	2,000
12.	Stayman,	1,000
13.	Baldwin,	4,000
14.	Ben Davis,	3,000
15.	Rome Beauty,	1,000
16.	York Imperial,	12,000

These varieties number sixteen, and even taking into consideration the thousands of trees, and the large expanse of our orchards we feel that by cutting the varieties down to eight or ten, adding the number of trees on to them, the crop would be easier handled and the company would receive better returns on the whole. All sixteen of these varieties are of the best for a commercial orchard, and so I shall make my selection from these which would be in the order of ripening:

Yellow Transparent	Early Summer.
Wm. Early Red	
Summer Rambo	Late Summer.
Wealthy	Fall
Grimes Golden	
Jonathan	
Stayman Winesap	Winter.
Rome Beauty	
York Imperial	

I think that all of these varieties are adapted to your soils. The Stayman Winesap that you grow over here are particularly fine. I have never seen any better Staymans anywhere. They are highly colored, fine in size, and the quality is excellent.

Yellow Transparent is the first summer variety to ripen, and is without any doubt the earliest to bear fruit of any of our varieties. It even bears while in the nursery. Ours bore fruit the first year set out. We gave an order to the nurserymen for Yellow Transparent trees, and before they could be shipped to us, we received word from them to come down and pick our fruit. This variety is very profitable, but requires very careful handling.

Williams' Early Red is a very beautiful, bright red apple. It is a favorite on the eastern markets for its season. Like the Yellow Transparent and all early varieties, the skin is tender and easily bruised, and is, therefore, best handled in small packages. Under favorable conditions it becomes large and more than one picking is required to secure the fruit in prime condition. The prices we received for them were exceedingly good, and I would prefer Williams' Early Red to all other varieties of that season.

Question. How often did you have to go over your Yellow Transparent to get them right when picked?

Mr. Cohill. We had to go over our Yellow Transparents five or six times last year in order to get the fruit in prime condition.

W. C. Tyson. What package do you use for summer apples?

Mr. Cohill. The five-eighths basket, but we are going to also try the box next year. We do not know how it will work out, but we shall give it a trial.

Mr. Newcomer. Which do you find the more profitable, Yellow Transparent or Williams' Early Red?

Mr. Cohill. There is more money in the Williams' Early Red, although the Yellow Transparent is certainly good. The people seem to demand a red apple, and we try not to give the dealer a red apple until the Yellow are done, so do not ship both apples to same dealer.

Mrs. Michener. Do the red apples show bruises as readily as the Yellow?

Mr. Cohill. Not quite. All early varieties must be handled exceedingly careful.

Question. Do you ship them in iced cars?

Mr. Cohill. Not last year. We expressed them. Had not enough on account of uneven ripening; could not get carload lots.

W. C. Tyson. Do you find them as profitable as winter apples?

Mr. Cohill. We find them more so. I do not advise planting an orchard without some early varieties.

Question. When does the Williams' Early Red come in?

Mr. Cohill. Just before or about the time the Yellow Transparent has gone out.

Mr. Boyer. Are you using the Williams' Early Red as fillers?

Mr. Cohill. Yes, we are.

Mr. Newcomer. What is the form with the older trees?

Mr. Cohill. We find the young trees very hardy and a prolific bearer. Have not had any experience with older trees, as all ours are young.

Question. What is the form of the Yellow Transparent?

Mr. Cohill. It is an upright grower, and is quite difficult to prune.

W. S. Adams. Is Baltimore your market?

Mr. Cohill. We can sell early apples anywhere. We shipped most of ours to New York, but Baltimore is all right on early fruit.

Summer Rambo. Is a very productive, vigorous and healthy tree, producing a large apple with red stripes or red check. This variety is a quick seller, and can stand rougher treatment than the two previous varieties. It is a very attractive, brilliant red apple of excellent quality, a good keeper, yields well, bears early and is profitable.

Mr. Eldon. Do Summer Rambo bear early?

Mr. Cohill. They bear early and I think you will find them profitable for the season. If you are not going to plant a large orchard, I would advise you not to get many Summer Rambo.

Mr. Eldon. How often do you pick them?

Mr. Cohill. We only picked them once, but if you have any quantity it would probably be more profitable to pick them two or three times.

Question. Are they as profitable as the earlier ones?

Mr. Cohill. No, not for us.

Mr. Eldon. Do they bear as early as the other varieties?

Mr. Cohill. No, not as early as the Yellow Transparent or Williams.

Grimes Golden is a standard favorite of wonderful popularity, juicy, spicy, and rich, a beautiful, transparent apple, golden yellow, one of the best sellers on the market, comes into bearing early, yields, crops the fifth year, it is a late fall variety. Grimes Golden is, with us, the apple. It certainly is a fine apple, and a good yielder. We get fine crops from our young trees. Your soil is adapted to them, and I would advise you to plant Grimes Golden. We have between 7,000 and 10,000 eight-year-old Grimes, and have gotten three crops. Nearly all are bearing now.

Jonathan. For many years has ranked as a standard of high quality; originated from a Spitzenburg seedling. More valuable than the parent variety on account of early bearing, longer life and greater productiveness; medium size, a beautiful, brilliant red apple; highly flavored, rich, tender, and spicy, has good keeping qualities and yields abundant crops early.

Question. How many did you have this year?

Mr. Cohill. We had quite a lot of them. Could not say as to prices, but they were good. Jonathan and Grimes Golden brought the best prices this year.

Mr. Frazer. Are Grimes Golden trees weak in any way?

Mr. Cohill. Not ours; we find them very healthy and strong.

Question. How about working them on York Imperial?

Mr. Cohill. Would be an advantage probably, as the Grimes is not considered a long-lived tree.

Question. Would you advise working the Grimes on Northern Spy?

Mr. Cohill. I have not had enough experience to tell you.

Stayman Winesap as a commercial variety is surpassed by no other, and by some authorities is called the most successful apple grown; medium size, a beautiful dark, rich red, good eating qualities, as well as good keeper; the fruit is far superior and the tree is much stronger than the original Winesap, long lived, early bearer, good yielder, a later winter variety.

Question. Do you notice a difference in your Stayman?

Mr. Cohill. No difference that I can see, only in size and color. The exhibit of Staymans by Tysons are the best I have ever seen.

Rome Beauty. An established and highly profitable variety of good quality, size large, shaded with bright red, good keeping, a hardy and vigorous grower, and very reliable in its production. Tree bears early.

Mr. Newcomer. How does the quality of Rome Beauty compare with Stayman?

Mr. Cohill. The quality, I think, is much better; it is one of the best in quality. It is practically like the Smoke House.

Question. Does it bear heavily?

Mr. Cohill. Very heavily and early, too. It is recommended as a filler.

Mr. Newcomer. If you were planting a large orchard, would you use it?

Mr. Cohill. Yes, we planted a great many and I should highly recommend it.

Question. Do you find them more susceptible to diseases, scale, etc.?

Mr. Cohill. No, they have been free from anything that would tend to injure them. We have no scale and no fungii to amount to anything.

York Imperial. A popular and reliable variety, medium yellow, almost covered with bright heavy red, flesh firm, large in size, shape oblong. A large producer and fruit keeps well. It is a very profitable commercial apple, of which there is always a uniform demand, a late winter variety. You will not go wrong in planting York Imperial.

Location for Apples.

Secure rich, fertile land of a heavy character, high elevation, with plenty of air circulating, with good drainage. Avoid low lands, hollows and pockets.

To Lay Off Land for Planting.

First lay off a right angle in line with the slope of the land, so that in cultivating the tree rows will not be subjected to washing from excessive rains. Second measure and stake off the distance between each tree row at each end of the plot from top to bottom of the slope. Third start at first stake at bottom of slope, using a two-horse barshear plow, with poles as a guide, plow out the center, then throw out three furrows on each side of the center furrow.

Selection of Trees.

Be certain to purchase thrifty trees with good tops and roots that are grown by the nurseryman from whom purchased. Have the trees dug in the nursery just as soon as the leaves mature in the Fall, have them forwarded just as soon as dug. Go right to the nursery, help to load them on cars and stay right with the trees.

Question. Can you tell the varieties in the nursery?

Mr. Cohill. A man that is experienced in nursery work can tell it. Be careful not to plant anything like crown gall or aphis.

E. P. Garrettson. Will not the crown gall appear in the trees a year or two after planting?

Mr. Cohill. It will increase.

Question. Have you seen it grow that way?

Mr. Cohill. Yes, and we have lost some in that way. The crown gall increases until it kills the tree. Would not advise much pruning. If there are any long roots, clip them back so as to fit in the hole nicely.

Mr. Myers. How about the roots which tend to go downward?

Mr. Cohill. Make the hole deep enough so as not to cut that root off. If a real long root, it might be cut off a few inches.

Immediately after arrival at your railroad station take them to the prospective orchard, this is very important. Do not allow trees to remain on station platform in wind and sun for a day or two and then blame the nurseryman if they do not grow.

Caring For Trees on Arrival at Orchard.

At a central point in the area to be planted, select a well drained location to heel in the trees, so they will be convenient for planting.

To heel trees, plough out a deep furrow forty to fifty feet in length, turning the earth down the hill, using shovels to clean out furrow, putting loose earth on top of furrow just thrown up; this will make a slight ridge to support the body of your trees. Cut open bundles of trees spreading them out side by side, roots in the furrow with tops laid down horizontally against the earth thrown up, all tops lying in the same direction. Plough another furrow right over the roots, using shovels again to clean out the furrow for the next layer of trees, continue this process until all trees are packed away. See that all roots are covered air tight at least twelve to thirteen inches above the bud, keep all varieties separate in sections, with each section labeled.

Remove all sod, leaves, fodder, straw, boxes, etc., leaving no place for mice to nest, as mice are very destructive to the roots of young trees. Plough a deep furrow around the upper side to drain out water. This leaves the trees in good shape for planting or should the weather interfere with planting, the trees are secure for the winter.

For a Puddle Hole.

Dig a hole in the ground about two feet deep, five feet long and two feet wide, convenient to the trees, put in the hole a barrel or two of water, also one hundred pounds of tobacco dust, stir thoroughly, mixing clay, water and tobacco dust. While pruning drop the trees into this hole, roots downward, leaving them there until ready to plant; this will revive the trees and kill many injurious insects, should there be any on the roots of the trees. This is also a convenient place to keep the trees from drying out between the time of pruning and planting.

Pruning.

Prune off all broken roots, also cut out all crowding and interlocking roots.

Now We Are Ready For Planting.

We have a boy fourteen to sixteen years old to carry the trees from point where they are heeled in, to men planting, dropping each tree at a point where the wire crosses tree row to be planted. Take enough No. 12 galvanized wire to make two lengths from bottom of slope to top. Use a reel on which wind wire at foot of slope. Measure off twenty feet for a border from starting point at top and bottom, this will leave room at the end of your orchard to turn teams in cultivating, etc. Stretch out one of the wires for your first row, next measure off the distance you wish the tree rows apart and stretch the other wire; this will be your second row. We use two men at each end of the wire and four men at the center, using the wire to plant by. The men work in couples. The two men at ends work towards the center, the two couples at the center work in opposite directions, until they meet the men coming from the ends, then they all move over to the other wire and work back to their starting places; then both wires are carried forward to their proper positions and the work goes right on.

Question. How long is the wire?

Mr. Cohill. One-fourth mile in length.

Question. How do you move it?

Mr. Cohill. Have men scattered along. Each has a certain section to work in. All have the same number of trees to put in.

W. C. Tyson. How do you stretch that wire?

Mr. Cohill. We have a reel at the foot of the slope and stretch it as tight as we can get it, with bar and brace. Dig the hole at the same time the tree is planted and make it large enough to accommodate the tree.

Trees should be planted at least two inches deeper than they were in the nursery and on steep slopes four inches deeper than they were in the nursery. Holes must be dug to accommodate the tree in hand so that roots can be spread out and not touch the sides of the holes; the subsoil must be thrown to one side replacing two to four inches of good rich soil in the bottom of the hole. One man takes the tree, spreads the roots out with one hand, and the other man with the shovel throws in a shovel full or two of good mellow rich soil, then scatters about a half pound of tobacco dust and bone meal in a hole on top of first two shovel fulls of soil. At the same time the man with the tree in his hand takes the other hand to work the soil between the roots thoroughly; this done, one man fills the hole while the other tramps the earth solid with his feet as each shovel full is thrown in. When finished a man cannot pull a tree up with one hand, and if it can be pulled up with one hand we do not consider the tree properly planted.

Under this system we have planted twelve hundred trees per day. The average will probably be one thousand trees per day, and 99½ per cent. of them grow.

We have found it dangerous to plant trees when the soil is dried out. We prefer to plant apple trees in the Fall of the year just as early as possible after the leaves have fallen from the trees or any time during the winter or early spring when not freezing.

YELLOW TRANSPARENT.
One of the best of Early Summer Apples. Note the heavy load of fruit.

SOME COMMENTS ABOUT IMPORTANT APPLE VARIETIES.

H. P. GOULD, *U. S. Department of Agriculture.*

In the many lines of progress that have occurred in the rapid development of the fruit industry in recent years, there have been none greater than the changed conceptions regarding the *variety* in its relation to successful fruit culture.

Though for many years following the formation of the American Pomological Society about the middle of the last century, its most conspicuous work was along the line of variety adaptation, its influence was apparently somewhat restricted—much more so than in more recent years—and apparently not largely felt by the mass of those who were planting fruit trees.

In the early days, the fact that a variety was pleasing when grown in a particular place was taken as prima facie evidence in great numbers of instances that it would be equally as desirable a hundred or a thousand miles distant where the environment was entirely different. Not so at the present time! There is nothing more conspicuous to the discerning fruit grower and nothing more interesting than the great variability of varieties in their response to the influence of environment, for we have come to think of a variety, not as an entity in itself but of a plastic thing which is the product of the influences under which it is grown.

It is worth while in this connection to ask: "What are the influences which affect the behavior of a variety, making it valuable in one place and perhaps worthless in some other?" In other words, what constitutes the environment which determines whether a variety inherently meritorious, is good or bad in a particular place? In the last analysis, the two great determinants or limiting factors for all plant life, and to a considerable extent also of animal life, are temperature and moisture. In the case of cultivated plants we must also add the soil factor and methods of culture. It may be doctrinal heresy to admit it but personally, I put less stress within certain rather broad limits upon the soil factor than upon any of the others that are really dominant in any particular. And for the tree fruits I place greater importance upon the character of the subsoil than upon the surface soil.

To give satisfactory results with any variety of fruit, a soil must have certain characteristics. It must contain sufficient plant food in an available form to induce a good vigorous growth of wood. In other words, it must be sufficiently fertile for the end in view. To this end it must contain humus or decaying vegetable matter in considerable quantities. A soil deficient in humus, more or less broadly speaking, is an unproductive or non-fertile soil. It must be a soil that is sufficiently porous and light to permit water to percolate through it readily. Such a soil as this will also be easily penetrated by the roots. These last two tenets apply particularly to the subsoil.

I place so much importance upon the subsoil because it is that very largely in which the roots are imbedded. It is the subsoil very largely that acts as a reservoir for the moisture supply required by the trees. If it is too compact and hard the moisture does not pass through it with sufficient freedom, either up or down, and the roots find too much obstruction to readily penetrate it for food and moisture. Given these characteristics and a soil so far as the soil factor itself is concerned may be looked upon as having the requisites for fruit growing.

And now that I am referring to this soil factor, I want to mention one other feature. It may be that each fruit variety requires for maximum results its own particular type of soil but I question if we can recognize this from any practical standpoint, on the basis of the soil itself, to the extent that is sometimes assumed. The soil performs three functions in relation to a tree growing in it: (a) It serves as a means of holding the tree upright and in place; (b) it is the source of mineral plant food either contained in it naturally or applied by the act of man; (c) it serves as the direct source from which the tree gets its supply of moisture. A soil may be too light in one extreme or too heavy in the opposite extreme, as we ordinarily use these terms, to come within the broad limits implied in the outset.

There is a most intimate relationship between the moisture supply and the mineral food supply because the latter is available for the use of the tree only as it goes into solution in the water or moisture that is in in the soil.

Again, as soils of different types and in different conditions may have different temperatures, there may be a temperature factor involved in the relation of a particular soil to the behavior of a variety.

Now suppose we think we have found for a particular variety the exact type of soil both with regard to its physical condition, its relation to the supply of plant food, moisture and temperature for maximum results in every respect. Very well! But the very next season after we have reached our conclusions it may be abnormally rainy, or abnormally dry or excessively hot or cold as the case may be. We at once have every factor in our scheme thrown out of adjustment and the relationships of food supply, moisture and temperature are entirely disturbed. As a result we find our chosen variety giving maximum results perhaps on an entirely different type of soil from the one we have previously had under consideration, even though that type remains unchanged as a type.

Then, too, we have a variety growing on a particular type of soil and giving certain results under some definite system of soil culture and orchard management. We change our system of management and totally different results follow. Yet the soil, as a type remains the same. The thing I want to impress upon you is simply this: Granting for the sake of the argument the possibility of there being varietal preferences as to soil types within the broad limitations already specified, the soil influences so far as they affect the behavior of a variety are constantly at work conjointly with all the other influences which go to make up the environment—and a variety is largely the product of its environment. It therefore follows that when we consider the matter of varietal adaptability we must consider it in the light of all the influences that affect its behavior in any way. A variety may be of value or it may not be, depending upon the conditions under which it is grown, and the better we understand those conditions, the more nearly can we make them what we want them to be.

There are various other phases of this matter I should like to discuss but I am already too far from the point of my subject. Time forbids that I wander farther away, except to say that we are in the habit of looking upon many things as pertaining to the soil in its relation to fruit growing that are not soil factors at all. A soil that is too moist may need draining but that is a matter of drainage, not of soils, *per se;* or too much moisture may be the result of too much rain and that is a matter of climate, not of soils; a lack of moisture, or of plant food or of humus to modify the physical condition—these have to do with soil management, not with soil types and soil characteristics. But we sometimes charge them all up to the soil! Methods of culture and of orchard management are fundamental in their influence upon the adaptability and relative value of a variety. Herein lies the phenomenal success of one fruit grower and the flat failure of another when perhaps the natural advantages outside the nature of the men involved are the same in both cases. Herein the grower displays his discrimination as to the peculiar needs and requirements of each variety and his ability to meet those requirements—for not all varieties can be treated the same way with equal success in every case. And it is in the management of an orchard that soil conditions are properly maintained and ameliorated as the case may require.

To return briefly to the temperature and moisture factors. This brings us back to a consideration of the climate in its effect upon varieties—for temperature and moisture are two conspicuous elements of climate in relation to plant life. With a low temperature, and as a result moisture largely in the form of ice and snow, the typical vegetation is moss, stunted evergreens and other growth which characterize the Arctic regions. Given a higher temperature and much of the moisture in the form of rain and we have the mixed, varied and abundant vegetation common to the greater part of the United States. A high temperature and the absence of rain and the Sahara and the Great American deserts appear. A maximum in both temperature and rainfall and the luxuriant vegetation of the tropics is a result. Thus you will see the part played by these two limiting factors—temperature and moisture. To say that each variety of apple or peach or strawberry requires for maximum results its own particular degree of temperature and its own definite supply of moisture at particular periods or epochs in its seasonal life—different from every other variety—may be going farther than we have any right to go at this time, yet from an extreme point of view I think this is theoretically true. Practically, the discriminations may be too minute to be of any real importance in most cases. Yet we know that some varieties will successfully withsand adverse climatic conditions which will utterly destroy others: so after all, there may be more in my proposition than we can now fully comprehend.

But climate in its effect upon plant life—and upon fruit varieties—is a complex matter. There is more to climate than temperature and moisture even though we sometimes overlook the fact that this is so.

In naming the different elements of climate we would need to mention:

1. Precipitation (rain and snow).
2. Temperature.
3. Extremes of heat and cold.
4. Times and frequency of frost.
5. Amount and intensity of sunshine.
6. Humidity and transparency of the atmosphere.
7. Direction and velocity of wind.
8. And perhaps the electrification of the atmosphere.

We can readily understand that some of these at least in addition to temperature and moisture have a very close relationship to the behavior and value of different varieties.

Another very important matter in the adaptability of varieties is the location and site selected for the orchard. There are countless orchards throughout the country that are practically worthless because of their location. But when we stop to consider the significance of the location we find that it is mostly *local climate.* It has to do with frosts, and air drainage which are temperature factors; with soil drainage which is a moisture factor; and with winds, etc. So here again we come back to the climate. We must consider the climate in its several elements at every turn.

But I have not forgotten that my subject calls for some comments about apple varieties. Perhaps, though, I need make no apologies for the background I have endeavored to set up. Perhaps any remarks about the adaptability of varieties that may follow will have greater significance than would otherwise be the case because of the "setting" which I have tried to place for them.

Even now before I reach the part of this discussion which gives my paper its title, I want to ask your forbearance a little further. I have recently been very much interested myself in making a sort of inventory of the apple varieties that have entered into American pomology. A portion of this inventory may not be without some interest to you because of its connection with your state.

About six years ago there was published a bulletin by the United States Department of Agriculture, in the Bureau of Plant Industry series, entitled: "Nomenclature of the Apple: A catalog of the known varieties referred to in American Publications from 1804 to 1904." You will at once see the comprehensive character of this bulletin. The year 1804 was taken as the starting point because that is the year in which the first list of apple varieties grown in America was published. It therefore marks the beginning of American catalogs of varieties. The work of compiling the data for the bulletin mentioned was completed in 1904, thus making the period covered by it an even hundred years. The American publications reviewed for the data, included the standard pomological books, horticultural society reports, experiment station bulletins and reports, horticultural papers and magazines, etc.

The catalog contains all known names of varieties that had been published up to and including the year 1904 and approximates 14,800 in number. This includes all synonyms as well as accredited varietal names. Of the latter there are about 6,700 in number. This means of course that there has been that number of different varieties referred to by name in American publications in the hundred years that is covered by this catalog. A bit of arithmetic shows 8,100 synonyms, thus giving as an average more than two names apiece for every variety, but as several varieties have over forty different synonyms to their credit and others only a slightly smaller number, the distribution of names is not on a very equitable basis.

These totals do not include the crabs. If they are added to this inventory the number of accredited names is increased by about 375, making in all 7,075. Two hundred and seventy-five names are added to the synonyms making 8,375, thus bringing up the total number of published names, including synonyms, to about 15,400.

Of the approximately 6,700 (not including the crabs) accredited varietal names, the origin of about 3,900 varieties is known with more or less certainty and designated in the bulletin mentioned by state for the native varieties and by the country for the introduced or foreign sorts. Of these 3,900 varieties, the origin of which is designated 309 if my account is correct, are accredited to Pennsylvania though in case of 42 of these—a rather large percentage to be sure—there is some question as to their being of Pennsylvania origin.

Of course a large proportion of the 6,700 varieties in the catalog, are now unknown in cultivation. This is made evident by the last revision of the American Pomological Society's "recommended lists" of varieties for cultivation in the various sections of the United States and Canada. This revision was published in June, 1909, as Bulletin 151 in the Bureau of Plant Industry series. The list of recommended varieties of apples contains 319 names of varieties which have been recommended by some fruit grower, professional pomologists, or others capable of giving advice in the matter for planting in some section of the country. The inference is then that a little more than 300 varieties include all, or at least nearly all, (not counting local sorts many of which are valuable), of the really important sorts that are being grown at the present time. In fact it would be surprising if this number could not be greatly reduced without loss to the apple industry. Pennsylvania is credited with seventeen of these 319 sorts as place of origin with three additional ones that are doubtful in this respect. Forty-nine of the 319 are of foreign origin including twenty-four Russian sorts and several which originated in Canada.

With so long a list of varieties from which to choose, there is some difficulty in deciding just what ones should be named in the present connection. As a foundation for a list it is of interest to refer to the revised catalog of recommended varieties of the American Pomological Society above mentioned. For the district that includes this region, the following varieties are the ones highly recommended: Benoni, Early Harvest, Gravenstein, Grimes, Maiden Blush, Margaret, Red Astrachan, Rome Beauty, Smokehouse, Stayman Winesap, Wealthy, Winesap, Yellow Transparent, and York Imperial—fourteen varieties. But Adams county is very near the border line between two of the districts defined by the American Pomological Society. As the boundary limits of these districts are more or less arbitrary it may be of interest to note the highly recommended varieties in the adjoining district. In addition to the above named sorts, they are as follows: Arkansas (Mammoth Black Twig) Ben Davis, Bough (Sweet Bough), Buncombe, Chenango, Gano, Golden Sweet, Horse, Ingram, Jefferis, Jonathan, Limbertwig, Missouri, Oldenburg (Duchess of Oldenburg), Ralls, Rambo, Red June, Red Stripe, White Pippin. This increases the list by nineteen varieties—a total of thirty-three varieties combining the two lists.

Of the well tested commercial varieties this combined list contains some of the most valuable sorts suitable for planting in the middle latitudes—material for some very choice selections.

And added comment about the more important of these varieties will serve to indicate their predominant characteristics. Benoni is a beautiful little apple of high quality ripening in this section the latter part of August; too small for commercial purposes but excellent for home use. Early Harvest, Red Astrachan, Maiden Blush and Gravenstein are standard early sorts probably too well known to require comment. Red Astrachan has a lot of faults but as an early variety, red in color, I know of nothing to take its place. For a first early variety Yellow Transparent has attained front rank pretty nearly all over the country. The tree sometimes blights but it is very valuable for all of that. Smokehouse and Wealthy are early fall—probably September varieties here—of much intrinsic merit and for their season it is doubtful if there are any better for this section. Grimes and Jonathan are used as "running mates" in many sections and are of first importance. There are few varieties grown commercially that are so high in dessert quality as these. Excellent sorts they are, on which to make a reputation that will be a distinct market asset. Grimes scalds in storage too badly to be very satisfactory for that purpose, but as a fall sort it has few equals.

C. J. Tyson. Does Grimes scald early in storage?

Mr. Gould. I am inclined to think so. I saw some in Washington a few days ago, from storage, that were very badly scalded.

R. M. Eldon. Do you think they should be picked a little greener?

Mr. Gould. It is a question if they should not be picked a little riper than is customarily done. That is the case with the York Imperial. The more highly colored you can get that variety the less it will scald.

Grimes Golden is one of the four varieties that they grow out in Grand Valley of Colorado, the others being Jonathan, Winesap and Rome Beauty. They have found, in recent years, that these four varieties are giving the greatest degree of satisfaction.

Question. Is that Stayman Winesap?

Mr. Gould. No, the common Winesap. They are planting Stayman a little but not very extensively yet. These varieties are giving great satisfaction there, so they do not have the inducement to plant other varieties that might otherwise be the case.

Jonathan, normally of about the same season as Grimes is an excellent storage variety and in some sections it is one of the three or four most important commercial varieties. It has a wide range of adaptability and is being extensively planted. While it might be unwise to plant it extensively in Adams county without more preliminary tests, I am impressed with the probability of its value. I think there can be little doubt about the value of Grimes for your conditions when properly handled.

Looking at the exhibits here and talking as I have with your people, makes me more firmly convinced that Rome Beauty and Stayman Winesap are two of the most important varieties that can be grown here, unless they develop some faults here which I know nothing about. Stayman sometimes lacks a little in color especially on young trees but as they obtain a little age, this difficulty largely disappears. Rome Beauty may have some defects peculiar to this section which I do not know about but a short time ago one of the finest specimens of this variety that I have seen in a long time reached our office in Washington from Biglerville, this county.

Winesap, though it is a magnificent variety in New Jersey within a radius of twenty miles of Philadelphia, may approach its northern limit of adaptability in this section on account of the elevation, though I am not sure but that it is entirely satisfactory here.

York Imperial is too well ensconced in the hearts of the fruit growers of this section to call for any comment though it is a little lacking in dessert quality.

I have now referred to all of the sorts mentioned in the first list of recommended varieties, also Jonathan of the second list because of its value in conection with Grimes. The varieties recommended for the adjoining district cover conditions that are very diverse from those in the district in which Adams county occurs. Therefore a considerable proportion of them are not to be considered in the present connection. Several of them, however, may well be referred to briefly for the purpose of pointing out their faults as well as to indicate their merits.

Arkansas, more widely known under its synonym, Mammoth Black Twig, is an excellent apple of the Winesap type and has a magnificent tree but it is generally such a shy bearer that it is unwise to include it in a commercial orchard, except in a very few localities.

Ben Davis I had intended to pass over in silence but a few days ago I noticed in a report of the proceedings of the American Pomological Society, published nearly fifty years ago where John A. Warder, one of the most conspicuous pomological geniuses this country has yet seen, recommended it to that Society with the remark that he did not wish to say much about it but that he believed "It is a variety that will yet make a noise in the world." How true this prophesy has been made into history!

Sweet Bough is widely grown in this general region of the country for an early sweet sort. Jefferis for late summer or early fall has decided merit. It is of Pennsylvania origin and doubtless deserves a greater popularity than it now has. Oldenburg (Duchess of Oldenburg) for a second early apple would probably be successful, though its quality is not high. and its value is entirely for culinary purposes.

Question. Can we get anything to take its place?

Mr. Gould. Williams Early Red will come nearer it than anything else I know.

Ingram, which originated in Missouri, a probable seedling of Ralls, is valuable in some sections because of its lateness in ripening and its long keeping qualities. It is a late blossoming sort and because of this fact is sometimes bears a crop of fruit when other varieties are destroyed by late spring frosts. I am not aware, however, that it has been tested in this section. It ought to be tried here for a long keeping sort. Rambo is a Pennsylvania standby which has much to commend it for its season though apparently it was relatively more popular formerly than it is now. White Pippin has a wide range of adaptability as we find it doing finely in Maine, in Maryland, Missouri and Kansas to say the least, and I do not know how much more widely it is scattered but under the diversified conditions in the regions indicated, it seems practically certain that it would do well here. It has been mistaken sometimes for Yellow Newton or Albemarle Pippin, though its differences are well marked to the critical eye. I have not seen it from Pennsylvania but think it is worthy of consideration for this section.

The other varieties recommended in the second list are not sorts that I should care to commend to you for this section so will not take the time to refer further to them.

In addition to these varieties there are several others that are important sorts elsewhere but do not appear to have attracted attention in any part of this State. I refer to Early Ripe which is an early variety of increasing importance in the early apple industry of Delaware and New Jersey, that ripens nearly with Yellow Transparent. In Delaware they sometimes pick before it is matured. It is a remarkable apple It holds to the tree well after it is matured and may be picked when quite green.

Williams likewise is a very valuable early sort in the states just mentioned. It has sometimes been confused, however, in at least one nursery in this state with Sops-of-Wine, a very different apple, the latter being sold as Williams Favorite which is also a synonym of Williams. Cornell (Cornell Fancy) is another second early sort, commonly credited to Pennsylvania—the southeastern part of the state—for its place of origin. It is a very desirable variety of high quality and I believe might with profit be given a much more prominent place in this section than it is accorded.

Thaler should perhaps also be mentioned in this connection. This is a Russian variety and nearly or quite indistinguishable from Yellow Transparent in fruit but the tree is said to be more vigorous than Yellow Transparent. It is very rarely grown, at least not under that name. It may be confused with Yellow Transparent in some cases.

In some parts of your state, Wagener is popular though inclined to overbear. For a winter apple, however, it may have merit for your conditions, It is of good quality; frequently recommended to be used as a filler because of its early bearing and rather small size of the tree.

Another variety, one which has been attracting considerable attention in Virginia for the past few years is Lowry. It originated in Nelson county, Virginia, a good many years ago, but it is only recently that it has become prominent. It is a beautiful red or indistinctly striped apple of good size—a good keeper and prolific. But like all the rest of its kind it has a weak spot. It is not quite good enough in dessert quality, still it is fair in this respect. I do not know of its having been grown north of Virginia but mention it to call your attention to its possible value here.

Now if a grower was selecting varieties to plant for a succession of ripening from early to late from the varieties already mentioned, he would not want all of them unless he was undertaking to plant a variety test orchard. Individuality of choice would have a considerable range. My particular selection would be no better than that which any one else might make but if I were planting a commercial orchard in this section to include a full sequence of ripening, I think my choice, in the light of my present knowledge would be about as follows: Yellow Transparent (or Thaler), Early Ripe, Red Astrachan, Williams, Cornell, Maiden Blush, Gravenstein, Wealthy, Smokehouse, Grimes, Jonathan, Stayman Winesap, Rome Beauty and perhaps York Imperial. If I could find something to substitute for Red Astrachan I would do it but I know of no red variety at present that will take its place. And if I could handle to advantage more mid-season sorts I should want to add Jefferis and Summer Rambo because of their merit.

Question. Would you advise that many varieties for a commercial orchard?

Mr. Gould. Yes, if you want a succession of ripening to ship all the time, from the earliest ripening varieties to the winter sorts; but otherwise, a much smaller number of varieties would be advisable.

This selected list is rather short on winter varieties. If I should find that Winesap warranted it, I would add it to my collection. And Stark would be an acquisition here if it will do as well as it does in some sections of this state. Ordinarily it is rather coarse-grained, not particularly attractive in color and rather indifferent in quality. But we recently received at our office in Washington specimens of this variety from this state (Landisburg or Waynesburg) that were exceptionally fine—very attractively colored, a beautiful finish and remarkably good in quality for the variety. If such fruit could be duplicated here, this would surely be an excellent variety to plant.

C. J. Tyson. What reason would you have for recommending it where Stayman Winesap could be grown?

Mr. Gould. Not any, unless yon wanted it to interplant for cross-pollination. It would not be wise to plant any variety without some other sort for cross-pollination. So far as a profitable commercial apple is concerned, I do not think it would come up to Stayman Winesap.

C. J. Tyson. How about Paragon?

Mr. Gould. Paragon is too much like Arkansas, in that it is generally a very shy bearer. The fruit is also very much like Arkansas in every respect. It is very difficult to tell them apart.

Mr. Newcomer. How about Akin?

Mr. Gould. I do not know anything in particular about that apple. It is an unknown possibility for this section. It is a very pretty apple, red in color and good quality. I never have seen it from this section and do not know how it would be here.

C. J. Tyson. How about Magnate to replace Stark?

Mr. Gould. It is too early. It ripens earlier than Jonathan does. A very excellent apple where it is well adapted.

W. C. Tyson. What do you know of Ewalt?

Mr. Gould. It is one of the old apples that has been grown over a large section of the country. A pretty good variety, but I think there are enough other varieties as good, or better.

W. C. Tyson. It is largely grown in Bedford county, and they regard it out there very highly as a market apple.

Mr. Cohill. How about Maiden's Blush?

Mr. Gould. I have already mentioned that variety in connection with several other widely grown and generally valuable, early sorts.

Sutton Beauty would be a consideration to add to the winter season. I do not know of this variety anywhere in this state but in New York it has been planted more or less in recent years and it is apparently growing in popularity in that state. It of course does not follow that it would be of value in this section but its possibilities are worth consideration.

Lankford, a Delaware seedling that originated nearly 70 years ago has become quite widely disseminated though it is not extensively grown. It may have some possibilities as a winter variety for this section.

With these other winter varieties I have mentioned, if I could find evidence that they were well adapted to my location, I should be inclined to drop York Imperial from my list as it isn't quite good enough in quality to conform to my standards and add one or more of these other sorts. I know that is a good deal like throwing a bomb and I may be slandering your most profitable variety. The fact still remains, however, that it does not rank very high in quality.

We might go on in this way almost indefinitely but time forbids anything further than to enumerate some of the varieties that are now attracting attention which have unknown possibilities for this section but which are worth testing. Perhaps in such an enumeration Delicious should head the list because of its widely advertised qualities and its recognized merit under suitable conditions. King David is its counterpart. Oliver Red under the name *Senator* has also been considerably advertised and planted but the tree is too susceptible to disease to recommend it. Likewise Collins Red has been disseminated widely under the name *Champion* and while this is productive and beautiful in appearance, it is too poor in quality to commend it to discriminating planters. The last three sorts mentioned are chance seedlings from northwest Arkansas.

Adding still others to this category, there is Akin from Illinois, Bloomfield from Maryland, Doctor included in the first list of "apples most commonly cultivated" that was published in this country, though still unknown to most fruit growers, Virginia, Beauty from southwestern Virginia; Carson from northern Ohio; the Magnate which originated apparently from the same collection of Winesap seeds that produced Stayman Winesap from eastern Kansas; Ensee from southern Ohio; Florence, an apple somewhat similar to Jonathan having a fine virogous tree but less desirable in dessert quality than Jonathan from northwest Arkansas; Mother perhaps now a century old, coming originally from Massachusetts, but still largely unknown; Coffman an early sort of much promise from Tennessee; Celestia, another sort from Ohio; Ramsdell (Ramsdell Sweet) referred doubtfully to Connecticut for its origin; Adams, a long keeping variety of the Rambo type and of good quality from Blair county, Pa. All these, and almost an endless number besides are worthy of some very definite consideration by those of you who are seeking a reputation for the production of apples of strictly high grade as to quality and beauty of appearance.

And still we need others. Of this collection, not one is perfect; not one that does not have some fault or objectionable feature of some kind either in fruit or tree.

Following up the history of nearly all of our most valuable and best known varieties, we find where we can trace them to their origin that they came into being in most cases as chance seedlings, without the aid or intervention in any way of man.

In this connection it may not be inconsistent for me to repeat what Marshall P. Wilder as President of the American Pomological Society said repeatedly 50 years and more ago: "It was my first, so shall it be my continual and last advice: 'Plant the most mature and perfect seed of the most hardy, vigorous and valuable varieties; and as a shorter process, insuring more certain and happy results, cross, or hybridize your best fruits.'" This advice I wish was being more commonly followed to-day. If "chance" has accomplished so much in the past in producing apple varieties, what are the possibilities in the production of varieties in the future, should all the knowledge of the present time regarding plant breeding and heredity be directed to this end?

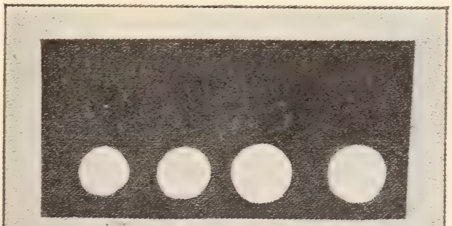
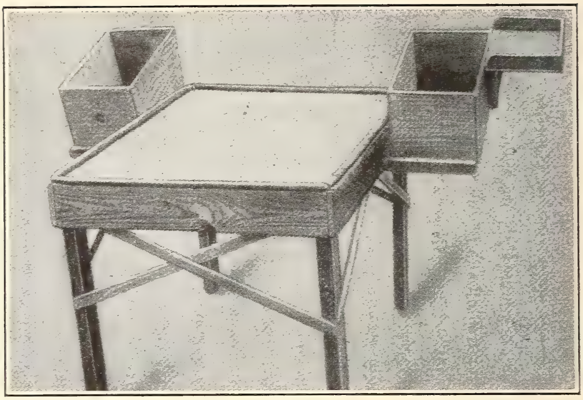


FIGURE 10—GRADING BOARD



Packing Table in General Use.
(Courtesy Better Fruit.)

GENERAL ORCHARD MANAGEMENT.

Samuel Frazer, *Orchardist, Geneseo, N. Y.*

In discussing this question of General Orchard Management it may be wise to first relate the story of the beginning of our young orchards. These were planted nearly four years ago. At that time I had the idea that the best thing for me to do would be to top work most of the trees to the varieties I intended to grow. I did not top work everything, but planted some varieties as they came direct from the nursery in order to have them as checks. I may say at the outset that I am not in favor of the top-working and have been forced to this conclusion by my own results. It may be that as time goes on I shall see reason to change my mind. Thus far I am not prepared to advise it.

We have something like 150 acres of apples, the permanent varieties being Baldwin, Greening and Northern Spy. There are but 10 acres of bearing trees on the farm; among these we found 3 Greening, 3 Baldwin and 3 Spy trees which appeared to be better than the others, and almost all of the wood we needed for top-working was taken from these trees. In order to have a complete check on the method I top-worked six rows of Greening with scions taken from an ordinary nursery. I may say here that these do not show the same type of foliage that we find on our own trees. We can detect individual differences in trees, and we know that in some cases these are transmitted.

We began by planting our trees in the spring with the idea of budding them in the fall. A few which were planted the fall previous were grafted in the spring in the limbs, and we secured about 80 per cent. stand of the grafts put in. At the time of budding we had a small epidemic of fire blight. The nurseryman had contracted to change the tops of the trees as I desired, therefore, he had to do the budding and grafting; and although, I told his man I did not want him to try to bud any trees which showed fire blight, he would persist in taking the chance of putting a bud in and going several inches below the seat of infection. In most of such instances he managed to get the knife covered with the bacteria from the diseased tree and he would inoculate the succeeding ten trees; and, since we were putting in four buds, one on each side of the tree we had four seats of infection. The weather was favorable for its rapid growth and there was nothing left but to condemn the trees. Out of some 8,000 trees 2,800 showed fire blight that fall. In my judgment it was better to remove them and burn them than to try and clean it up; so we took them all out the next spring; and I requested the nurseryman to send me trees to replace them, which he did.

In this case, however, we adopted another policy: We were able to plant the trees the last of March, and in April beginning even before there were signs of growth, we sawed the tops off at the height of 18 inches from the ground and put in a graft. I may mention that these trees were ⅝-inch two-year-old buds. Generally speaking, we had a very good stand and these grafts would make a growth of from 2½ feet to 4 feet that season; and, if it was necessary to do any more top-working, I would prefer to do this in preference to any other. Personally, I would rather grow the trees from individuals and take the time, rather than try to top work. I think I can get a better head and save much trouble afterwards; for it is necessary to go over all these trees carefully, even to-day, to make sure that shoots are not coming out of the stock, and all of this difficulty is avoided when the trunk is the same as the top.

Planting.

In planting we usually prune the roots as little as possible, merely remove any injured roots. Prune the tops after it is set. We dig as small a hole as we can and put the roots in, and insist on the soil being well packed round them; this is the most important thing in planting. Take a tamper along and make sure that no roots are left out of contact with soil. If the tree has four limbs we do not touch it. I would not on any account cut back the ends of the branches. If it has five or six limbs I would take one or two off, leaving three or four. If it is possible, we like to space these limbs six inches apart, so that if the lowest begins at 18 inches from the ground the highest would be nearly 3 feet. In the case of varieties which tend to droop as R. I. Greening, I have left a few trees with a leader for experimental purposes, but in the bulk of the cases we have merely the four limbs.

I understand from others that it is going to be more difficult to handle these trees successfully than it would be if the leader were left. We shall know more about this matter later.

The land we took was not in the best of condition. Most of it needed underdrainage in order to give good crops and permit of proper cultivation. The land is a little too heavy for potatoes and the results we secured from trying to grow corn between the trees were not encouraging. It seemed to shade them too much; so that we are growing the trees without any crops on the land between them. We plow the land or disk it as soon as possible in the spring and keep it cultivated until July or the first of August, at which time we sow a cover crop. During the past year on 200 acres of orchard we sowed a mixture of 1 pound Cow Horn Turnips, 4 pounds Dwarf Essex Rape, 5 pounds Crimson Clover and 5 pounds of Red Clover per acre, and in addition, we allowed all the rag weeds, pig weeds and other weeds that would grow to come up. Some of them have made a wonderful growth the past year, growing tall enough to hide a horse. We manure the apple trees each year, with a light dressing of farm manure. The first two years we gave them a small application of probably 1 to 2 pounds per tree of a mixed fertilizer about 3.8.8. This past year we have used Basic Slag on some of the apples at the rate of 800 pounds per acre on bearing trees. and have had very marked results. Certain trees were left as checks, and on them the foliage was not nearly so large, nor was the growth made this season so long. In the past we have had more results from Acid Phosphate when applied to the peaches than from any other fertilizer, but during the past year we did not get any results with either Floats at the rate of 1,200 pounds per acre, with 500 pounds of Iron Sulphate or from Basic Slag at the rate of 600 pounds per acre, or Acid Phosphate at the rate of 600 pounds per acre. The trees did not show any improvement over those which had nothing. We shall continue this experiment for certainly two or three more years, since these trees are located on one of our best soil types.

Pruning of Peach Trees.

When we plant the peach trees we cut them off to a stub about 12 to 15 inches long. On this we allow 3 limbs to grow, removing any others. Since that time these trees have not been pruned. They were 3 years planted last May and last year they bore a sufficient number of peaches so that the sales were $50 per acre on one block of nine acres. Our trees do not make the growth that yours do in this vicinity; they have not the size that yours would have, but they are much larger trees than those grown in orchards where heading back is practiced each year; and by allowing them to bear early they will get the necessary spread of limb and open center which we aim for. The trees are full of fruit buds and it hardly seems necessary to do any pruning this year, except in the case of a variety like Late Crawford, which makes a great deal of wood. We shall be able to pick everything from the ground next year as we did this. As they begin to grow higher we shall head them back.

On Herbert Wadsworth's Estate at Avon, trees handled about the same way yielded as high as 10 and 11 baskets, that is one-third bushel baskets per tree; in other words, a yield of 3 to nearly 4 bushels of fruit. These trees had been manured during the first two years of their life. The soil is sandy and they have been kept cultivated all the time, absolutely clean tillage. The trees have not been pruned at all. Alongside is a small apple orchard, trees were planted four years ago. Some of the Hubbardston trees had from 75 to 126 apples each, which made a good crop for so young a tree; in fact, it was necessary to thin them two or three times to prevent their over-bearing. While the limbs and tops of these trees may have appeared close, this weight of fruit is giving them the necessary spread, and limbs which would appear too close are now pulled down, so that they do not need to be removed. The permanent trees in this orchard are Baldwin and are the same age. Almost every tree had from 30 to 40 apples on. The results thus far secured by leaving the trees alone are such that we are encouraged to do less and less pruning.

Mr. Gould. I think these results are due to the method in which the trees are started and that it is necessary that this be kept in mind. Won't you please go over that again?

The way of pruning is very important. Leave 4 limbs six inches apart on the trunk if you can. We find we can do it. Do not cut the terminal buds off these limbs. Remember they are the ones which will come into growth first and if removed the tree will probably be all of ten days longer in getting the latent buds into leaf, and that ten days cannot be recovered. We must get leaf growth —in order to get root growth. The sooner the tree gets into business after it is planted the better. In some cases when we cannot get the branch where we want it we have put a bud in the trunk. We have tried yearling buds and some two-year-olds and like the yearlings very well. At the end of four years they seem to be just as far ahead as the two-year-olds. They are very easy to plant. One block of 1,000 were put in this year at the cost of about 1½ cents each for planting.

Pruning Old Trees.

In the case of trees at the bearing age which have been neglected and allowed to become quite thick, we found it advisable to prune such only during the bearing year. Pruning them late in the season after the blossoms have fallen. In this way we have avoided any tendency of water sprouts. We find we can take much more wood out with safety than if we prune in a year that the tree is not bearing, and in the case of all varieties which bear every other year normally, such as Baldwin, I would rather wait one year and prune heavily when they are bearing. There is one rule we give in regard to the amount of wood which shall come out of a tree. It is this: 1. Remove all dead wood and badly diseased limbs. 2. Remember that the sun must reach all parts of the tree sometime in the day. If it cannot reach a limb, either that limb or some other must come out. Another rule is this: If it is a question of an upper or lower limb; save the lower.

Member. Do you knock some of the fruit off?

Mr. Frazer. Yes, but we have to thin anyway.

Member. Is it true that in some of the New York orchards they have nearly eliminated the so-called off-year?

Mr. Frazer. Yes. It is being eliminated, even with such varieties as Baldwin. B. J. Case, of Sodus, has had seven successive crops of Baldwin. Of course, varieties like Duchess of Oldenburg and Maiden Blush bear every year with us anyway.

Member. Do you do it entirely by thinning?

Mr. Frazer. Thinning and pruning.

We have a bearing orchard of about 6½ acres of trees scattered over ten acres. It had been neglected and was about 33 years old. The trees were 33x33 feet apart. They were all touching and were too thick. The orchard was in sod and was rented for pasture for the sum of $25.00 per year and the most the crop had sold for was $75.00, according to the statement of the tenant. I paid the tenant $75.00 to let me have it; and in May, 1906, I borrowed a spray rig and we sprayed it. We did some pruning, taking out the dead wood. We sold the fruit on the trees that year with 400 barrels which I had ordered for $900.00. We made a map of the orchard showing the varieties. The following year was the off-year, and the land was still in sod, and the crop sold for $630.00. In 1908 the land was plowed and every other tree had been removed during the previous winter. We were able to do this from our map, having carefully noted on it all trees which were of poor varieties or injured and making careful tally to find which row would need to be removed in order to leave the most good trees. We took out every other row on the diagonal, sometimes some good trees had to come out; in other cases we had to put a young tree in, but in spite of the loss of trees the yield that year sold for $1,320.00. The trees were pruned again, taking those which were in bearing. The following year we sold for $1,340.00 and this year, 1910, which should have been our big year we had very poor weather at the time the Greenings were in bloom and had a very small crop of this variety, which constitutes a large proportion of the orchard; so that our yield this year will not sell for much more than $1,200.00.

Spraying.

Our method of spraying during the past year was to spray about the time the buds were breaking until the leaves are the size of a mouse's ear, with lime-sulphur 1 to 9 with 2 pounds of Arsenate of Lead to 50 gallons. This takes care of the Blister mite which is moving at that time and the Arsenate of Lead is for the bud moth and case bearers which have been a serious trouble in Western New York. We intended to spray again just before the blossoms opened, but left it until the blossoms fell. The omission of No. 2 spraying was a mistake, I believe. The second year we had the orchard we used Bordeaux mixture and Arsenate of Lead for the spraying after bloom, but we had so much injury from the Bordeaux that we have not used it since, using merely Arsenate of Lead. This gave us good results. We sprayed the trees from 3 directions with Arsenate of Lead at the strength of 2 pounds to 50 gallons, and on trees which would bear 10 to 14 barrels we find we have applied about 17 gallons of solution to a tree in the three sprayings. This was followed in ten days with a light spraying of weak Bordeaux with Arsenate of Lead. This past year, however, we changed our policy and used Lime-sulphur at the strength of 1 to 33 with 2 pounds of Arsenate of Lead as soon as the blossoms fell and did not apply so much to the tree, but even with this we found we encountered russeting where the fruit met the full force of the spray. Where the fruit did not get the full force of the spray the Lime-sulphur tended to control the natural russeting of the fruit; and in a neighbor's orchard where the material was put on with a hand pump at a much lower pressure than we put it on, the russeting was almost eliminated; while in a neighbor's orchard which was not sprayed, it was quite prevalent; so that we are convinced that russeting may be due to natural causes as well as spray injury, and may result even when Lime-sulphur is used. Our modified method of this year was not thorough enough to control all the coddling moth. Next year we intend to make our Lime-sulphur much weaker probably 1 to 70 and resort to a thorough drenching of the tree as soon as the blossoms fall in order to control the coddling moth.

We tried making our own concentrated Lime-Sulphur, but cussed it and quit. We had —the picnic of our lives. Your Prof. Stewart told us all about it at one of our meetings, how nice and easy it was to do. He told us how to cook it. We tried it in the basement of the creamery. It fumigated the creamery all right. Just about the time we had it all nicely cooked, for some reason it would boil over, and half of the contents of the barrel would be on the floor and sailing down the sewer before we could catch it. Someone has to boil it. I am willing to let the other fellow do it.

Member. What kind of a sprayer do you use?

Mr. Frazer. A Deyo engine and Goulds pump. When we spray for leaf-curl on peaches, which must be done when the land is quite soft, too soft to take our big rig on the land, we have a small one which consists of a Gould's pump and a couple of barrels in the box of the wagon. In the case of the currants we find we have to use a hand pump on some narrow rig such as a stone-boat in order to drive in among them. We intend to make a little narrow wagon for this purpose.

Member. Do you plant when the land is wet?

Mr. Frazer. Yes. We have planted when we had to bail the water out of the holes. In some cases we filled in the soil and left the tree and the trees are doing all right.

Member. Do you plow the land or do you plant in sod?

Mr. Frazer. We tried to plow all the land before planting, but some places we planted in the sod and plowed after. We had 20,000 trees to plant the first year and could not get anything together until the first of April.

Member. How do you handle your peaches?

Mr. Frazer. We have tried to not plow our peaches. We have worked down the weeds and cover crop by running a disk harrow over the land in four directions; this chops them up. Later we follow with the Planet Junior Orchard Tool, No. 41 or 42, putting on the narrow teeth, afterwards we put on the wide teeth. In this way we work up the surface soil, alternating sometimes between the disk and the cultivator and spring tooth harrow. We vary the tool according to the soil and its condition. As I have said before some of our land must be underdrained so that we can go on it early in the season. In regard to varieties I do not feel like trying many new ones. Our permanent trees are the standard sorts, namely, 60 acres of Greening, 60 acres of Baldwin, 20 acres of Spy, are planted 50 feet by 44 feet; as fillers among these, planted at 25 feet by 22 feet, we have 20 acres of McIntosh, 20 acres of Wealthy, 20 acres of Wagner, 10 of Hubbardston, 10 of Duchess of Oldenburg, and the balance are Rome Beauty, Boiken, Maiden Blush and Twenty Ounce.

Member. Will the tree roots not interfere with the drains?

Mr. Frazer. I do not think they will.

Member. What varieties of peaches do you grow?

Mr. Frazer. Mainly Elberta, with a few Crawfords and some Belle of Georgia, and we are trying a few other varieties. The Belle of Georgia has done very well for us.

Member. What have you after Crawford?

Mr. Frazer. We have a few Niagara and a few Salway. We ate our last Salway after election. Our Elbertas were sold at $1.80 per bushel in the village. The Niagara ripen with the Late Crawford.

Member. How about putting barn-yard manure on peaches?

Mr. Frazer. In New Jersey we keep the manure away, but on our land we are not likely to get too much manure on it.

The cost this year for labor and teams to cultivate the orchard was about $15.00 per acre. It cost us more the first year to cultivate our currants because they were planted on a piece of land which was full of quack and we cultivated that field fifty times during six months. On those thirteen acres of currants in the spring we find it necessary to keep one man on the field all the time. We can only work it with one horse now since the bushes are large. We keep an exact record of all work done on each field. Each man has his time sheet and his time and that of his team is charged up to each field each night. So far we have not been able to secure more than $200.00 per acre, gross, on our bearing orchards. We hope to get more. We hear such stories about some of the orchards of the West yielding from $800.00 to $1,500.00 per acre that one is lead to wonder whether their acres are average acres or not.

I was in a four-acre block of Twenty Ounce and Alexander apples this year at Hilton, N. Y., and the fruit from it was sold two years ago for $6,400.00, or $1,600.00 per acre, and I judge it would make about the same money this year. This represents what is obtainable. We pick our fruit in baskets. We pack some in boxes, but have generally used the barrel. We usually make three pickings of our Greenings and the same of Spy and have made two of the Baldwins. The fruit left on the tree will frequently double in size in ten days. We are very much troubled with mice; and in the winter time, in order to protect our trees we bank them with soil and when the snow comes high and drifts we have to tramp it round the trees. Last year this took all our force for about three weeks to keep our trees protected. We find it necessary to throw some soil to them in September since the mice will work even before snow comes. I have seen as high as 15 per cent. of the trees 30 years old injured by mice during the winter. I know of one man who lost one-third of his trees which were from 15 to 20 years old in a single winter because he neglected to protect them from mice.

R. M. Eldon. What time do you bridge graft?

Mr. Frazer. Just as soon as we can in the spring. Bridge graft all girdled trees just as soon as the ground is thawed and the sap begins to move. We drive our chisel right into the wood above and below the injured portion. Cut the graft to fit the place and spring it in; tie it in with raffia and wax it. Cut the raffia about ten days or two weeks later. Allow one bridge graft to each inch of injured surface. If they do not take, of course, the tree may have to come out. One important thing is to stake the tree and tie it firmly to the stake so that the wind will not blow it and spring the grafts out.

Member. Is it as good to top-work at the time of planting as it would be to grow the tree one year and top-work the next?

Mr. Frazer. With us the tree is more susceptible to fire blight if the top-working be deferred than it would be if done the first year. If I were doing it to-day I would either graft as already outlined or insert 3 buds, one above the other on the windward side of the tree about one inch or 1½ inches apart in August after planting. If all take, cut two off when you come to top the tree. You have three chances. Do not allow more than one bud to grow. If all three buds fail the tree can be grafted the next spring. I would not care to advise anyone to try top-working, although some of our growers feel that they must top-work King just as some of you feel that Grimes' Golden is worthless on its own trunk.

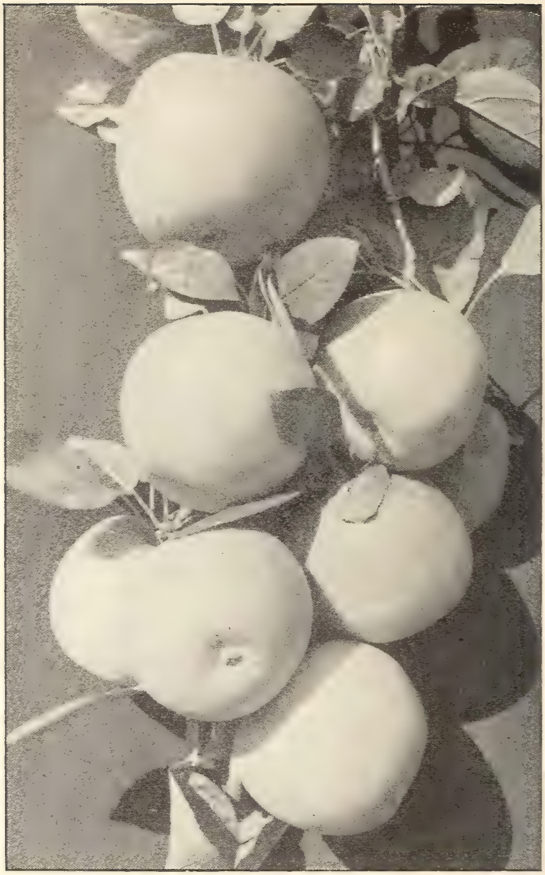
E. B. Snyder. What would you advise planting to top-work?

Mr. Frazer. We have tried to get Talman Sweet since it has a good trunk. I prefer it to Northern Spy, since we find a number of trees which show color rot.

R. M. Eldon. Would you prefer budded trees to root grafts?

Mr. Frazer. I have no choice. I think, however, I would rather buy a Northern Spy root grafted than trust to a budded tree of that variety.

A Plate of Apples from Adams County.



A Cluster of Adams County Grown "Winter Banana," (every speciment perfect.)

MANAGEMENT OF 700-ACRE ORCHARD FOR ONE YEAR.

Mr. Cohill.

Again it is my pleasure to address this Association, continuing our talk of the preceding day to the culminating phase of orcharding, its management.

This is an exceedingly broad subject and my object in view is to give simply and briefly the essential points of the management of a 700-acre orchard for one year. It would be the work of volumes to enter minutely upon the details of orchard management and my idea is to speak in general upon the essentials. Any points on which my assistance may be of aid to you. I would be only too glad to help you if I can. Don't hesitate to interrupt be at any time.

I want to bring out a point in Mr. Frazer's talk, which covers our conditions, regarding potato culture in an orchard. We allow our men to have patches. Usually they plant potatoes, with the result that the fruit we harvested (the first three crops) was practically worthless, hardly any value at all. Other places, where fertilizer, manure and cover crops were used, we had almost the same result, and it looks to us as if we would either have to grow fruit or potatoes. We plant the trees so close, 20 feet apart, that it is not profitable to raise anything between them.

We pay our laboring men $1.50 per day, 15 cents an hour, and furnish married men with a house costing about $600.00 or $700.00, then charge them rent covering the interest, or $4.00 per month. We, also, give them truck patches, furnish them with wood, horse to drive to town, etc.

Question. Do you give them time to raise potatoes?

Mr. Cohill. We stop at four Saturday afternoons and give them horse and plow to care for them.

Pruning.

It is very important that young trees get proper pruning for much depends upon it in the future. In many orchards improper pruning is practiced, while in others no pruning whatever is done. I must say that better results can be obtained from the latter. Many orchardists have the idea that after a bunch of men have been started to pruning that all is well, and they will do the work properly.

Well let me tell you that this is taking a long chance, for we have a high class of laboring men working for us, as well as responsible foremen, but nevertheless the field manager is on the job. We do our pruning during January, February and March, keeping a force out when weather conditions will permit, usually about half time is made.

These three months are usually severe but we find some very favorable weather, and with plenty of men, have time to treat each tree individually or in other words, treat each tree as though it were the only one we had. We had our inexperienced man with one of a year or more experience, making two men to each row, until the inexperienced men have been taught, then each man thereafter takes a row and is responsible for it.

Each man is equipped with a saw, large pruning shears and small hand pruners. Following behind the pruners is a boy to cover all wounds over half inch across, with white lead and linseed oil paint to prevent the exposed wood from drying out. We, also, use a boy to gather up the cut limbs and put them into piles. We use a team with light sled, with very broad, light bed, to carry the brush off to a vacant space to be burned. Be sure to haul this brush off before growing season, because there is nothing which looks worse than trash of this sort in an orchard, and it also prevents clean cultivation.

The old style of high-headed apple trees has gone out of favor with the progressive fruit growers, and the common sense method is taking its place. The low-headed trees have the advantage of high-headed ones in being easier and cheaper to spray, prune and gather fruit from, and less injury to dropped fruit, and less injury by storm.

The fruit will color and ripen as well. The disadvantages are none, provided they are pruned properly.

There is a great difference of pruning fruit trees, by growers, college professors, and men with theories, and one point upon which they differ mostly is the "straight leader" and the "open head."

We have experimented with the "straight leader" and the "open head" methods of pruning an apple tree, with the result of adopting the straight leader as the best.

Question. How do you get rid of the crotch?

Mr. Cohill. Nearly all growers agree that the "straight leader" avoids the crotch, and beginning when a whip, with careful pruning it can be entirely avoided.

Question. How long do you let the leader grow before pruning it off?

Mr. Cohill. Prune when planting, then the third year again. Our "straight leader" is much of a two-story type, for, by keeping the entire centre thinned out well when they bear, it opens up like the "open head" method, still getting the required support.

Question. How high is the first tier above ground?

Mr. Cohill. Start them about 18 inches. Do not let them go straight out, make them slant.

Question. How are you going to help it after they begin to bear?

Mr. Cohill. This can be avoided, to a certain extent, by proper pruning. I am going to give a table that we followed for our pruning as closely as possible for the first four years, using a straight leader as a standard.

First Year.

The first year consists of pruning done when the trees are planted but if any new shoots tend to make the tree unsymmetrical the tips should be pinched off in the summer to check their growth. This summer pinching of symmetrical shoots should be done whenever necessary in the following years.

Second Year.

Cut out all surplus branches and prune back the foundation branches from one-third to one-half their growth, making the tree symmetrical and leaving the central leader shoots longer than the others. Avoid crotches, as they will surely split later and ruin the trees.

Third Year.

Do not let two branches cross or rub, and if twigs have grown on the foundation branches near the trunks do not disturb them, except to cut back several buds to induce fruit spurs.

Fourth Year.

Until the trees begin to bear the foundation branches should be cut back annually to make them short and strong to support heavy loads of fruit in the future. After fruiting begins not much pruning is necessary, except to thin out surplus growth and keep the tree symmetrical. In cutting or sawing off all limbs the cut should be *made close* so *as not* to leave a stub. This is very important for wounds properly pruned heal over readily, while stubs seldom heal, thus decaying into the trunk is the result of weakening and injury to the tree.

Another very common mistake is pruning from the bottom up, but this should not be done. Prune from the top down.

Fertilization.

We get our fertilization in the form of manure, cover crops, and commercial fertilizer. We have excellent railroad facilities, having a siding of the W. M. R. R. right in our orchard. The most of our fertilizer is gotten in the form of manure, bought in the cities of Hagerstown, Washington and Baltimore, in carload lots, and our teams are kept busy hauling from January to March, or up until spraying season for scale. There were three cars standing on the siding when I left home, and the teams are now busy spreading it about the orchard.

During these months we have quite a little sledding snow, which is the best time for hauling heavy loads, so we get an unusually heavy supply during good sledding. It is best handled in Gondola cars which average about 30 tons.

Question. What does your manure cost you?

Mr. Cohill. Cannot say exactly but I think, at least, several dollars per ton.

Question. Is it worth it?

Mr. Cohill. Yes. The results prove it to be.

Question. How many tons to the acre?

Mr. Cohill. About eight or ten good wagon or sled loads, or ten forks-full to the tree.

Question. Do you use any other form of fertilizer?

Mr. Cohill. Yes. Cover crops and commercial fertilizer. If you have an orchard which requires a lot of cultivation and spraying, there should be two separate gangs to look after it. Both must be done thoroughly.

Scale Spraying.

Spraying for San Jose scale is the next work of importance with us, which we start just as soon as weather conditions permit, and push this work very hard in order to get our teams started on cultivation. If there is such a thing as a commercial orchard of any size being free from scale, I think we have one, for the State Entomologist and State Horticulturist, as well as the state orchard inspectors, go through our orchards every year and make close observations and have reported *free from scale*. We spray annually as a preventive using concentrated lime and sulphur 1 to 8. There is only one way in which to keep your orchard free and that is to spray every year and do it thoroughly.

Just as soon as spraying is completed we start on our cultivation. This year we expect to greatly increase our stock and run a separate crew of cultivators and sprayers, for cultivating really should be started when spraying starts, if the soil is in condition, and to get perfect apples it requires at least three sprayings. Previous to this, one force of teams have done the work, as the amount of fruit has not justified so many sprayings.

Horses vs. Mules.

The first thing of importance in cultivation, and in fact all orchard work where stock is required, is to select the animal to do the work, and we find the good mule our best friend in that respect.

Emphasis on the *good*, for usually when you speak of a *good mule* people laugh. A great many people do not know a mule only as a kicker, balker, and an animal with all sorts of bad faults, but let me tell you we have a lot of *good big mules* that have no tricks and beat the horse at every stage of the game.

We started with big horses and are replacing with big mules, our experience with them prove these advantages.

They eat less feed, they do almost twice the work on hot summer days. A man can kill a horse in summer on a hot day, but the mule can kill the man. They will stand rough treatment by indifferent drivers, just like a goat in getting over rough rock—breaks and new grounds, and are just as good on the road. These qualities are what a fruit grower wants, and a *good big mule* will fill the bill.

Spraying for the Protection of the Apple.

The codling moth is one of the most serious insect pests the fruit grower must combat. Data collected by the Government and State Experiment Stations have found that from forty to sixty per cent. of the annual yield is injured by the codling moth, which makes the fruit unfit for a market, and some almost worthless for home use. While a large number of up-to-date orchardists do spray for the pest, a vast majority do not appreciate the extent of the injury it causes.

The first spraying for the codling moth should be just as soon as the petals begin falling and before the lobes of the calyx draw together. This period of time is about ten days. Have a good mouthful of poison there when the larvae attempts to enter the apple.

Mr. Grove. How about spraying when in full bloom?

Mr. Cohill. We have never done that, and I could not tell you of the result.

Question. What kind of spray material do you use for scale?

Mr. Cohill. We use lime-sulphur, but there are other preparations that can be used just as successfuly.

Prof. Surface. How do you dilute Lime-Sulphur for summer spraying?

Mr. Cohill. For coddling moth 1½ gallons of concentrated solution 1 to 8 to 50 gallons of water used with Arsenate of Lead.

Two pounds of Arsenate of Lead is universally recommended applied along with 1½ gallons of concentrated Lime and Sulphur. We used this preparation as recommended by Prof. W. M. Scott, Pathologist, Department of Agriculture, with exceedingly good results.

We also made the second spraying for codling moth ten days later.

Cutivation.

On account of the location of the Tonoloway orchards, on such hilly and rolling land, the practice of cultivation will need to be modified because they cannot be handled like an orchard on level ground. In hilly or mountainous orchards clean cultivation cannot be safely adopted, on account of the danger of serious washing away of soil, unless furrows are plowed following the contour of the land, to check this washing.

We plow strips wide enough to cultivate with a harrow on each side of the tree, along the rows, in the spring and cultivate until July 15th or 1st of August. After thoroughly cultivating these strips, every other middle may be plowed, leaving one solid and one cultivated. The following year plow up the remaining middles and leave the other down in clover crop; these strips prevent washing. There isn't any land too steep to practice clean tillage by this method. After harrowing down, the fertilizer can be applied and a cover crop sown.

Mr. Roberts. What kind of harrow do you use?

Ans. We use a spring-tooth harrow.

Question. How do you harrow the lower side of the trees on the hillside?

Ans. That is a job. Go through on each side of your row with the harrow then zigzag in and out.

R. M. Eldon. Have you ever tried a spring-tooth harrow on the hillside?

Mr. Cohill. Yes. And I have seen it done.

R. M. Eldon. It is less painful to have the hired man do it than to do it yourself.

Prof. Surface. How close do you harrow to the tree?

Mr. Cohill. Right up to it. There is no uncultivated ground under the trees.

Question. Do you skin the trees?

Mr. Cohill. Sometimes a careless workman may do a great amount of injury. This should be closely watched.

W. H. Black. Do you practice that with a large tree?

Mr. Cohill. Yes, where proper pruning has been done.

Mr. Snyder. How do you plan to plow under trees?

Mr Cohill. Have an experienced man as leader, to plow the first furrow, one who is reliable and careful not to bruise the tree. He can plow with one hand under the trees. It is rather troublesome.

C. A. Griest. How much spread of limbs have your eight-year-old trees?

Mr. Cohill. In some places they touch, planted 20 feet apart. It takes width of two harrows on each side for cultivation.

Prof. Surface. Do you turn the ground toward the tree, or use the hillside plow?

Mr. Cohill. One year we turn toward the trees, another year away from the trees. If the land is steep, plow the lower side of tree row up the hill every year. On one farm we turned the ground toward the tree for seven years, with the result that the ground was piled high about the trees. They grew very little this summer, leaves were not bright.

Mr. Rinehart. What kept them from growing?

Mr. Cohill. We think the ground plowed up around the trunk of the trees kept the air circulation away from the roots.

Cover Crops.

For cover crops we use crimson clover, red clover and cow peas, using cow peas for a summer cover crop, and crimson clover and red clover mixed, on alternating years for our winter cover. I have with me a written account of the cost of maintaining (of what we think an ideal 30-acre apple orchard) for the first eight years, with details of cultivation, cover crops, fertilizer, pruning and spraying, and would be glad to show it to anyone interested. (Ed.—Statement reproduced at end of this paper).

A great many complaints are made by growers of their cover crops not taking, and the trouble usually lies in the ground not being properly prepared, and also if the ground is dry the seeding should be delayed until rain comes. Crimson clover especially will not germinate in dry soil. Run the harrow just ahead of the sower, not a week ahead, nor two days ahead, but the same day.

C. J. Tyson. Do you cover the seed?

Mr. Cohill. You can use a harrow to do that but we don't usually practice that. The important thing in my mind is getting the ground in shape and sowing at the proper time.

Good Roads.

I don't know how strong Adams county is for good roads. Good roads are an absolute necessity to the fruit grower, so when it is too wet to cultivate, make a good road through your orchard to the packing house. Get out your neighbors and everybody help repair the county road to your railroad station. You had better look after this because bumping over only a few stones to the station will ruin your fruit for market.

If you have a dirt road, get the county's road plow, a road scoop, and level up with *split* road drag. In the spring or early summer is the best time.

Peaches.

Although we only advertise our apples, we have 3,000 peach trees, all bearing, and from these we shipped 20 carloads this season, nearly all Elbertas and Billyeus—I shall, however, leave the *peach story* to Mr. Newcomer to tell the Association about the noted peaches of Washington county, Md.

W. W. Boyer. Should Billyeu be planted on low ground?

Mr. Cohill. I should not advise Billyeus being planted on low land. Our elevation is 1,100 feet.

Mr. Anderson. Do you use peaches as fillers?

Mr. Cohill. We have but would never do it again.

There is one thing we have had experience with in peach business, namely, using peaches as fillers in an apple orchard, and I certainly would not advise anyone to do it.

Mr. Keller. Why?

Mr. Cohill. Because, in the first place, the trouble this year has been with the curculio, with us. I would never do it again for a number of reasons of which I think curculio is the most important. Drive it off your peaches and it goes on the apples. We lost 90 per cent. of our apple crop mixed in with the peaches. They require different cultivation and different spraying.

Disadvantages.

Greatest disadvantage is curculio which over-balanced any other advantage. The profit of our peach crop was reduced by the loss from stung apples caused by curculio. Spray peach and he goes to apple. Early apples are better than peaches.

R. M. Eldon. Do your peach trees overgrow the apple trees?

Mr. Cohill. Our peach trees are now mixed with apple trees, apples 5 40 feet apart with peach fillers and at 7 years old they are coming together.

C. A. Griest. What fertilizer does it require to grow peaches?

Mr. Cohill. I do not remember and I did not put it down in my notes as I did not expect to talk about peaches. Will leave that to Mr. Newcomer.

After there has been so much work and care to grow the fruit to perfection, the important features in harvesting the crop include picking, grading, packing and erecting and maintaining a standard all combined to yield the largest net profits to the grower.

Picking.

It has come to be regarded among good orchardists, as important not to bruise an apple as it is not to break an egg. Careful handling of the fruit is the first essential to good prices. Good packing can be brought about by careful picking. The fruit must be picked at the right time, and handled with great care in getting it to the packing house. Do not pick all the fruit at one picking. This holds true with nearly all varieties for if the small apples are left upon the tree they will often increase in size enough to make A No. 1 fruit. In picking, see that the whole stem is removed and without breaking off the fruit spur, as the future crop may be injured. Keep the fruit out of the rain and hot sun.

Mr. Newcomer. How far apart were your pickings?

Mr. Cohill. Depending upon weather conditions, about ten days to two weeks.

We use a picking bag and pour the fruit into a lined box made of special durability, with sawed out hand-holes to lift by. Make the box to fit the wagon bed with a double decker type.

Grading.

We have not adopted the box pack as yet, for the barrel has been exceedingly profitable for us, although we expect to put up some boxes next year. The company thinks as long as they get $4.00 to $5.50 per barrel it beats the box. Solid cars of our Jonathans reached the price of $5.50 per barrel shipped direct from the orchard as soon as picked, to New York.

We pack three grades of barrels, fancy, No. 1 and No. 2's. The fancy and No. 1's have a label of the orchard company, while the No. 2's have no identification, but marked plainly a No. 2. The fancy is a large uniform, well colored apple of the variety, while the No. 1 is of a smaller uniform size, well colored, all larger than 2½ inches. The value of accurate grading of fruit to a uniform size and appearance, is the selling factor of any package, be it a barrel or a box.

Worming Trees.

This is one of the utmost importance to a young orchard. The best time to worm is in May or September; we worm our trees every year in the early fall. This busy little worm does a great deal of damage, and by the time we get around to him he has done what he thinks his duty in killing the trees.

Washing the young trees with whale-oil soap is the next fall work. This has a tendency to keep rabbits from tearing the tree, and is very effective against San Jose scale, and also makes the trunk and limbs clean and smooth. Dilute 2 pounds of whale-oil soap to 1 gallon of water, boiling the soap until dissolved and apply to the tree, either by spraying or put on with a whitewash brush, over the trunk, fork and main limbs.

I note with interest what Mr. Frazer tells about whale-oil soap controlling the worm. We have used whale-oil soap a number of years, both fall and spring, and, though it might have effect on them during egging, I think you will find the worm there just the same.

This completes the year's work, as this brings us within a few days of Christmas, and work is closed until the first of the year. So our only vacation is during the holidays.

ORCHARD EXPENSE STATEMENT FOR 7 YEARS.*

E. P. Cohill.

The following detailed statement by Mr. E. P. Cohill, Hancock, of his seven-year-old thirty-acre orchard is most valuable as a guide for Western Maryland. This orchard was handled as follows:

First Year.—Narrow strips cultivated along tree rows and cowpeas grown in middles.

Second Year.—Same as first year except that crimson clover was grown instead of cowpeas.

Third Year.—Same as second year.

Fourth Year.—All of the ground cultivated until August when red clover seed was sown.

Fifth and Sixth Years. Strips cultivated along tree rows and red clover left on middles until August when all of the ground was plowed and seeded to red clover.

Seventh Year.—All of the ground cultivated until August 15 when red clover seed was sown. Two hundred pounds per acre of a mixture of 12 per cent. phosphoric acid and 5 per cent. potash, were applied August 15.

Hogs were pastured in the orchard from May 1 to November 1 during the first six years. Mr. Cohill states that the manure and clover plowed under in this orchard have increased the value of the land at least twenty dollars per acre.

There are 3,000 trees set 20 feet apart each way in the 30 acres. They were planted in November, 1902, and April, 1903. Labor is figured at 15 cents per hour.

Statement by Mr. E. P. Cohill, Hancock.

3,000 trees,	at 12c	$ 360.00
Plowing before planting,		72.00
1st year. 1903.		
Fertilizer and Tobacco Dust,		25.00
Planting,		63.00
Manure,		75.00
Cultivating,		215.00
Cowpeas and Clover seed,		78.00
By Hog pasture,	84.00	
2nd year, 1904.		
Cultivating,		178.00
Manure,		67.00
Pruning,		12.00
By Hog pasture,	96.00	
3d year, 1905.		
Cultivating,		225.00
Manure,		120.00
Pruning,		26.00
By Hog pasture,	100.00	

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*From Bulletin No. 144, "Apple Culture", Maryland Agri. Exp. Station, Page 262.

4th year. 1906.		
Cultivating,		318.00
Manure,		125.00
Pruning,		12.00
Clover seed,		17.00
By Hog pasture,	171.00	
5th year, 1907.		
Cultivating,		260.00
Manure,		135.00
Pruning,		22.00
Spraying,		86.00
By Hog pasture,	150.00	
By Apples and Cider,	65.00	
6th year. 1908.		
Cultivating.		367.00
Manure.		60.00
Pruning,		20.00
Spraying and material,		225.00
By Hog pasture,	141.00	
By 150 bbls. Apples and Cider,	308.00	
Clover seed,		24.00
Picking, packing and handling apples,		63.00
7th year, 1909.		
Cultivating.		165.00
Manure,		115.00
Pruning,		17.00
Spraying and material,		293.00
Fertilizers,		78.00
Picking. packing and handling,		255.00
By Hog pasture,	192.00	
By 850 bbls. Apples and Cider,	1,952.00	
	$3,259.00	$4.173.00

These figures show that up to the end of the seventh year the orchard has not been self-supporting by $914.00, yet if we consider the increased value of the land, due to manure and cover crops, at $20.00 per acre the deficit is reduced to $314.00.

Some old apple trees on land purchased by Mr. Cohill several years ago have produced a full crop of apples each year for the last five years.

Another orchardist in Washington County makes the following statement from memory as he has not kept accurate records:

The trees cost $4.80 per acre and the planting $1.00 per acre. Crops were grown among the trees for the first five years and about paid the running expenses of the orchard. Ben Davis began to bear at eight years and York at twelve years of age. At the present time one-half of the orchard is twenty-one years old and the other half eighteen years and the most profitable crop brought $150.00 per acre while the average income is about $90.00 per acre. The crop is good on bearing years and about one-fourth of a crop on off years. Spraying costs $15.00 per acre. pruning $1.50, picking. etc., $16.00 annually.

Mr. Lupton. The beauty of this fruit growing business of ours, Mr. President, is that no two of us agree. Mr. Cohill seems to think that the future of apple growing is going to be in the hands of commercial or company orchardists. My belief is that it is the reverse that is likely to happen. It seems to me as soon as fruit growing gets beyond a man's personal attention he runs up against obstacles that are almost unsurmountable. My own belief is that the small grower, the man who has 10 acres in orchard, will be the man who will look after the best trade and get the fancy prices. We large growers will have to take ours to the cider-mill or to the canners. I feel like encouraging the small grower. I differ with Mr. Cohill in another particular. I think we should not plant Grimes Golden too freely. There is no question as to its quality, but it is universally conceded to be a shy bearer compared with York Imperial and some other varieties. To make the same amount of money out of Grimes Golden as York Imperial you would have to get twice as much per barrel. You have Stayman Winesap here that is worthy of going on the exhibition table anywhere. Very much better than those I brought up from Winchester. We have small lots of Grimes Golden all over the County of Frederick. We had a considerable output of Grimes this year, and they were very fine but the increase price was not enough to justify planting largely, then again the tree is subject to a blight that kills it anywhere from 10 to 15 years. Even as a filler, the disposition of the tree to be a shy bearer is a disadvantage. Many of our people are thinking highly of the Duchess. Our experience with the Duchess is very limited, planting so recently that on that point my own information is not worth much, but still our people are very much in favor of the Duchess.

Question. Would you think it worth while to work Grimes on York Imperial?

Mr. Lupton. I know so little about working one variety on another, that is, which variety is best to top work on another variety, that I hesitate to answer. You will have to get the advice of some expert in the Agricultural Department. My practice of planting trees in the fall is not so good as Mr. Cohill's. I always try to dig the holes so as to have them ready when the trees come. I never heel in the trees if I can help it. Plant right in the ground as soon as I get them, and plant deep and well.

Question. Do you think it would be an advantage to soak the roots long enough to revive the trees?

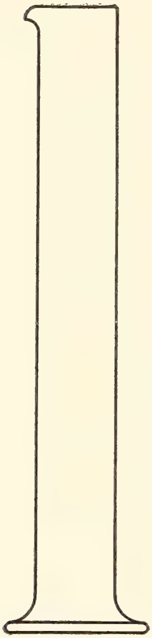
Mr. Lupton. I do not know just how much reviving they need, just how long they have been out of the ground. It might do to drop them in a puddle and leave them there a few minutes. I want to get them in the ground as soon as possible. I hardly believe, for small plantings as most of us are likely to do, that it is necessary to dig the holes until we get the trees.

Question. Is it an advantage to have dry soil or wet soil for planting?

Mr. Lupton. It has been our experience to have the ground fairly dry, otherwise our clay soils are apt to bake.

THE PROCESS OF DILUTION OF CONCENTRATED LIME-SULPHUR SOLUTION.

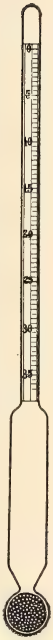
PROF. J. P. STEWART.



The following description and data are from Bulletin No. 99 of the Pennsylvania Experiment Station prepared by Prof. J. P. Stewart, whose work has been so beneficial to orchardists:

THE HYDROMETER.

This is an instrument much like that used in testing acids in dairy work, but with a wider range, and is used in determining the density of the concentrate preparatory to the dilution. These instruments are made in two scales, the specific gravity and the Beaume, both of which may be placed on the same instrument. Densities are expressed by the former in decimals and by the latter in degrees. The Beaume scale is somewhat easier to read, but the other is more convenient to use, inasmuch as the required dilutions can be obtained more directly from it. A desirable range is from 1,000 to 1.32 or 1.35 on the specific gravity scale or from 0 to 35 degrees or 38 degrees Beaume. Such instruments have been put up according to these specifications and are described herein. They are simple in use and indispensable in the accurate dilution of concentrated solutions.



THE PROCESS OF DILUTION.

In the application of any concentrate, either home-made or commercial, it is essential that a definite method of dilution be followed. Two solutions may look exactly alike and yet differ widely in density, so that any accurate method must be based primarily on the density of the concentrate that is being diluted. Moreover,, we believe that recommendations based on the density of diluted spray are preferable to those based on the number of dilutions, even when accompanied by a statement of the concentrate's density.

Accurate dilution is very simple and easily accomplished with the aid of a hydrometer having a specific gravity scale. (The presence of foreign soluble materials or of much roily sediment in the sample will vitiate the test, a fact which must be taken into account—the former especially in solutions of unknown preparation. Also, for exact work the temperature of the concentrate should be within about 10° of that stated on the outside of the instrument.) Sprays of any desired density may be obtained from any concentrate by simply getting the reading of the concentrate and dividing the decimal of this reading by the decimal of the spray desired. For example, if the reading of the concentrate is 1.27 (about 31° Beaume), to get a spray of 1.03 density we divide the .27 by .03 and obtain 9, which is the number of dilutions required and which of course is obtained by adding *eight* volumes of water. In this we are simply applying the general fact that the density of the solution heavier than water varies inversely with the number of dilutions.

Adams County York Imperials—"None Better Grown."

POTATO GROWING IN YOUNG ORCHARDS.

Samuel Frazer, *Orchardist, Geneseo, N. Y.*

The question of growing a crop in an orchard is one which we can discuss and probably agree to disagree upon. The prime object in growing potatoes is to make money. I am informed that your value of land is from $50.00 to $70.00 an acre. Your average yield of potatoes is somewhere near 90 bushels. So far as the value of the land is concerned you would be perfectly safe in using it for potato-growing. In fact, any land which will grow a good crop of potatoes and is under $200.00 an acre in value may be used for that crop, while if the same land should rise in value so that it is worth $300.00 or $400.00 per acre and the yield should not be increased it is doubtful whether potatoes could be grown at a profit. We have then one other factor to consider and that is the question of yield. Is it adequate to cover the cost of production? How much does it cost to produce an acre of potatoes? After you have paid this item and the rent and the interest on the money have you anything left? If you have not there is no use growing potatoes. In this crop you have to compete with many sections which are particularly adapted to potato-growing. For instance, Northern New York, Maine and parts of New England, so far as the main crop is concerned.

In regard to early varieties. You are in competition with other states. It is a question for each one to find out whether potato-growing is profitable for themselves. If potato-growing is not in itself profitable then it certainly should not be put in an orchard with the idea of getting a certain sum back to pay the orchard expenses. It is quite possible that you could charge off $8.00 an acre from the working expenses to trees, but I consider it is really unwise to try and grow the potatoes close to the trees. I would certainly leave 4 feet, the next year 6 feet, and later eight feet on each side of the row of trees. If the orchard be planted to fillers there is so little land left that I doubt whether it will pay. Orchards are worth so much more than potatoes that I would seriously question the avisability of growing some low valued money crop in them. If the money crop grown is highly productive and does not draw too heavily upon the soil I think it would be better. Or, again, it might be better to run the orchards in the extensive fashion, without a crop and concentrate on three of four acres on some other part of the farm and in this way earn sufficient money to carry the orchard. Or, we can look at the matter in another light, and that is, one which I use in almost all other crops, namely, you determine first whether you have or can secure enough money to grow the crop until harvest. If you undertake to grow radishes you may have to wait but six weeks; if you attempt to grow potatoes you may have to wait four or five months; if you plan to grow apples you have to wait six or seven years. I think it would be better to look at the subject from a business standpoint and try to get enough capital and get some way to carry the crop until it is ready to produce some revenue, and devote all the energy of the land to that crop. I hoped at one time that I could do otherwise, but I have been forced to this position by experience. I realize that my experience may be decidedly different from that of yours in this locality, and therefore, hesitate to advise you whether you should or should not grow potatoes in a young orchard. In some sections of New York our growers report adversely on growing potatoes, especially in peach orchards. They have had such poor results that they consider that they have lost two or three years growth of the trees, owing to the influence of the potatoes upon the peach trees; and if a potato crop makes $10.00 per acre, net, it is doing well, and in some cases we may get $20.00 or more net; but should that be secured by the loss of one peach crop or one apple crop we have a very large contra-account; for the one apple or peach crop will probably be worth as much money to us as five potato crops. Then, again, when a man is working potatoes there is a tendency to sacrifice the trees, which does not happen when there is no crop being grown. Another point with us is that we need organic matter in the soil, and are not able to secure enough to grow profitable crops of potatoes unless we have a rotation of perhaps clover or meadow one or two years in four and the orchard does not lend itself very well to such a practice.

To return to our first question that of cost of production, it might be wise to take one other crop as a sample. The U. S. Department of Agriculture has been determining the cost of production of certain crops in Minnesota and they find that it costs about $6.00 an acre for labor, teams, seed, etc., to produce a crop of wheat. This does not include any charge for rent. If now, the land be worth $50.00 an acre it would take $3.00 an acre to pay the interest on the $50.00; therefore, this is a legitimate rental and would bring the cost of production to $9.00. If the land be worth $150.00 an acre our rental would be not $3.00 but $9.00 and our cost of production would be $15.00. If we secure no more yield on the $150.00 land than we do on the $50.00 we find it would become unprofitable to try and grow wheat; for with an average yield of 14 bushels at $1.00 per bushel there would be nothing but loss; so that we may say that with our present mode of farming no man can attempt to try and grow a profitable average crop of wheat on land worth more than $100.00 an acre. He simply must cast round for some other type of farming. Our potato-growing involves a larger outlay for labor than wheat-growing. The important thing to remember is that rent should not constitute more than a certain percentage of the total cost, so that any crop which involves considerable labor can be grown on higher priced land than a crop which involves little labor, and we find that potato-growing has its limit, that is, about $300.00 per acre. In other words, we cannot afford to pay more than $18.00 an acre rent for land for potato-growing, and with average yields, no man could afford to pay this. No 90-bushel crop of potatoes could afford such a sum, in fact, it could not afford to pay much more than $3.00 or $4.00 rent. Orchard land on the other hand, with the large amount of labor involved and large amount expended for packages, frequently running to $100.00 per acre or more, can pay a higher rent than potato-growing, and yet, not have the rent a higher percentage of the total expense. So that we are really trying to grow a crop of fruit trees which will warrant the expenditure of a considerable sum of money in order to secure returns as soon as possible, and, at the same time, trying to devote part of the same land to a crop which will not warrant any such expenditure. This, however, is but one way in which the two crops conflict. The growing of potatoes gives no opportunity for the incorporation of a large quantity of organic matter.

C. J. Tyson. Our method is to grow an early crop of potatoes this year and then seed the land to crimson clover and the clover is turned in the following spring and that year a late variety of potatoes is planted, the land being seeded to rye after this, which is in turn plowed under and the following year the system is continued. In this way we incorporate organic matter and can grow our orchards.

Mr. F. I am glad Mr. Tyson gave this, because it shows a method which has been evolved to meet this situation, and it really comes back to each individual to determine whether it pays or not. I merely state the question as I see it and then want you to figure it out for yourselves.

I would like to give the figures which have been issued by the U. S. Department of Agriculture in regard to the cost of growing potatoes without fertilizer in Minnesota.

The statistics given in the table were collected from a large potato and grain farm in Clay county, Northwestern Minnesota, where 300 to 400 acres of potatoes are grown annually. During the years 1902-7 no fertilizers were used. These figures allow no charge for superintendence, which might be permitted to pass on a small farm where the farmer worked himself, but would be a factor on a large farm.

Cost of Producing Potatoes on Unfertilized Land.

Seed (12.1 bus.)	5.804
Plowing,	1.190
Harrowing,	.184
Cutting seed,	.801
Planting,	.620
Weeding (horse weeder),	.544
Cultivating, 3 times,	.294
Spraying, 3 times,	.294
Paris green,	1.282
Bluestone,	.528
Digging,	1.338
Picking up 127 bus. at 3½ per bu. and board,	4.806
Hauling and storing,	2.603
Machinery cost,	596
Land rental,	3.000
	26.366

The actual cost of production was 21 cents per bushel. It is not stated whether the above yield was total crop or saleable, but if the former then the actual cost of saleable potatoes per bushel would be nearer 30 cents than 20 cents. I think you will agree that this cost is low.

Cost of Producing Potatoes on Fertilized Land.

Spring plowing,	1.017
Harrowing, 4 times,	.765
Cost of seed (14.1 bus.),	8.472
Cutting seed,	.376
Treating seed,	.120
Corrosive sublimate,	.277
Planting,	.689
Fertilizers,	6.500
Weeding, twice,	.327
Cultivating, 3 times,	1.814
Spraying, 4 times,	.446
Paris Green, Lime, Bluestone,	1.833
Digging,	1.810
Picking up 162 bus. at 3½c per bu. and board,	6.362
Hauling, storing and sorting,	3.317
Machinery cost,	.596
Land rental	3.000
	37.721

The interesting thing, however, is the fact that even when fertilizers were applied the cost of growing a bushel was greater by 2½ cents per bushel than when no fertilizer was applied. The increase was not sufficient to pay for the cost of the fertilizer. Another point is that not all of the gain is saleable. I do not suppose the saleable potatoes were produced for less than 30 cents per bushel. Do you think you can produce them for less? This last year in New York State we are being offered anywhere from 25 to 35 cents per bushel for our potatoes. You cannot grow them for that money; our yield is not high enough. If you secure 100 bushels per acre of which 80 are marketable, and you get 50 cents per bushel you have $40.00 per acre. Personally, I cannot grow potatoes for less than $50.00 per acre, and the Maine Station find that it costs them $69.00 per acre, but under their conditions even this expenditure was profitable at 50 cents per bushel, but not at 30 cents.

Ten-acre Field.

Plowing at $2.00 per acre,		$20.00
Harrowing, 5 times, $3.00 per acre,		17.50
Fertilizer (home mixture), $30.00 per ton,		225.00
Seed (130 bus.) at 75c per bu.,		97.50
Disinfecting seed (labor and material),		3.00
Cutting seed (by hand) at 6c per bu.,		7.80
Planting, team and 2 men, 3 days, $5.00,		15.00
Harrowing or weeding before crop is up, 4 times,		10.50
Cultivating crop, 8 times, at $3.50,		28.00
Spraying, 6 times, ($1.00 per acre each application),		60.00
Hand hoeing and pulling weeds once (if necessary),		15.00
Digging and hauling to storehouse or station at $15.00 per acre,		150.00
Rent of land (5 per cent. on $50.00 per acre value), 10 acres,		25.00
Depreciation of implements (plows, harrows, planter, sprayer, digger, etc.), value $250.00 at 10 per cent.,		25.00
		$699.30
Value of crop, 225 bus. per acre, (2,250 bus. at 50c),		$1,125.00
Value, per acre,	$112.50	
Cost of growing, per acre,	69.93	
Net profit per acre,	$ 42.59	

It will be seen that it cost 31 cents per bushel to produce the above crop. Just determine the actual cost and see if the business pays, whether it is worth bothering with. If it will not pay to grow potatoes alone it will not pay to bring them into the orchard.

Member. How much commercial fertilizer will you use?

Mr. F. We have generally applied about 10 tons of manure with 600 pounds of mixed fertilizer made up of 100 pounds of sulphate of ammonia, 400 of acid phosphate, 100 of muriate of potash. We prefer the sulphate of ammonia to nitrate of soda.

Member. If the crop costs as much to grow as we get out of it, may the gain be said to be the cultivation and growth of the orchard?

Mr. F. We think if the trees be given a space of from 4 to 8 feet on each side of the trees from the first year to the fourth that it would be legitimate to charge $8.00 per acre of the total expense against the field to trees. There is one thing you must remember, and that is, that we cannot incorporate the organic matter so well in the future as we can when the trees are young. You cannot grow it under the trees when the trees are well grown.

Mr. Cohill. Do you think the potatoes have any effect upon the fruit?

Mr. F. I do not know. I stated that it has been reported to have an injurious effect upon peach tres. I have not seen it upon apple trees.

Mr. Cohill. We have allowed our men to grow potatoes among some apple trees and it seems to have had a bad effect upon the trees and the fruit.

Mr. Newcomer. What would you suggest growing with fruit? You want to make it self-supporting.

Mr. F. I have tried growing crops to make it self-supporting, but have stopped. I tried potatoes one year, the next year growing a cover crop and then the third year growing potatoes. They have just about paid their way and that involves a certain amount more work for nothing.

Mr. Anderson. Is there danger of fire blight due to the increase from fertilizers or putting too much fertilizer on the land?

Mr. F. There is not with us. On a large proportion of the land we plant in New York it is necessary to bring the land up. I know that on sandy land in New Jersey there is much danger from fire blight if the trees be manured. We try to get the trees to grow all they will, and I hope to get them bearing as soon as we can. If they can be made to bear at six years, I would rather have them do so, even if their life be reduced to 30 or 40 years. I think it will be better than to have the trees act as they have for some of my neighbors, that is, growing and never bearing any apples until 20 and the main consolation they have is that they will leave something to their grandchildren. I want them to do something while I am alive, so that I can spend the money, rather than grow it for some other man to spend. I want them to be of some use to me. The tree then is my crop. I find I am not big enough to look after the trees and several other crops at the same time, or else I am too lazy, so I am cutting out all of the extras that I possibly can.

In years of plenty we are bound to meet European competition. In England I have seen some farms which would turn off average yields of 750 bushels per acre. These were produced so that everything over 25 cents per bushel was gain. They can afford to pay our duty of 25 cents per bushel and the low freight charges and compete with us as soon as our prices go up to 70 cents. The sea coast prices are never as high as those of St. Louis. This is one of the things we must consider in the potato-growing business. Three hundred bushels is as easily grown as 100 is with us.

Dr. Stover. Do you sow buckwheat?

Mr. F. Sometimes. Frequently we sow crimson clover, with red clover with it as a cover crop in our orchards.

Mr. Fiddler. How is a poor man going to grow trees without some crop between?

Mr. F. The man must be a good financier. Do as the other men do in finance. When they have an idea and lack capital; float the proposition. Or else, develop some other part of the farm and make it carry it; or get some other crop than potatoes. If potatoes cannot be grown profitably, consider strawberries.

Mr. Snyder. Do you ever have trouble with flea beetles on the apples?

Mr. F. No, we never have.

Mr. Snyder. We have had trouble from the flea beetles leaving the potatoes and attacking the foliage of the apples.

Member. Is pear blight contagious?

Mr. F. Yes. It can be transmitted from the pear to the apple. For instance, if a knife or saw or pruning shears are used to cut off an infected limb and are then used on the following tree the healthy tree may be inoculated. The tools should be disinfected in corrosive sublimate after each cut, or the cut should be disinfected after it is made, whenever there is much fire blight prevalent.

One other difficulty in potato-growing among apples is that for potato production, the land should be plowed deeply. Ten inches of deep soil is none too much for good potatoes. By giving such a plowing, especially if we approach closely to the trees we may do considerable damage.

Member. Is it better to grow apples and potatoes with organic matter than commercial goods?

Mr. F. In my case I needed organic matter. The texture of the soil was not good enough and fertilizers would not improve it. The land had been rented for a number of years and had been skinned; it needed humus. This took time to grow or else one would need to put on large quantities of manure. Then land tended to bake, but as soon as it became enriched with organic matter the tendency to bake disappeared. We needed organic matter both for apples and potatoes.

Mr. Rinehart. Do you want plenty of organic matter for peaches?

Mr. F. We have not had any trouble in getting too much. I hesitate to answer the question for you in that way, because my conditions are not yours, and I cannot form an opinion of what I should tell you.

Member. How much wood do your trees grow in one year?

Mr. F. Apples will make 3 to 4 feet of wood. Greening is one of our best growers. One of our good trees is about 8 feet in diameter at three years old. Other varieties, such as Hubbardston, McIntosh and Wagner are small growers and would not make anything like this growth. There is one other question and that is in regard to the supply of seed. Whenever you put more labor on a crop or you put more time in spraying or apply more fertilizer it must be paid for, but it costs no more to plant a potato which is capable of giving 200 bushels per acre than it does to plant one whose maximum is 100 bushels. We know there are individual potatoes whose maximum yield is, say one pound, and there are others which can give us five pounds, and yet occupy no more land. It would seem to me that if one is going into potato-growing it is necessary to grow some of the best individuals. I do not say best varieties, because in my experience, there is just as much difference between the yields of individuals in a variety as there is between the varieties themselves. Therefore, I would urge you to consider this question. The ability of the individual to produce a crop can be determined by trial. If you select 1,000 good potatoes or 500 the method of operation would be about as follows: Take a piece of land no better or worse than the average and prepare it the same as for the rest of the crop. Prepare to plant by hand. Take the tubers to the field, having them, say 8 ounces each, so that they will make 4 nice sized sets. Plant them, probably 15 inches apart in the rows and leave a space of 18 or 20 inches between each four, that is, each individual potato will make 4 sets and will give you four plants. If you have 1,000 you will have 4,000 hills. By leaving a little space between every four there will be less liability of mixing when digging. Cultivate and spray the crop as you have done before and plan to dig it by hand, throwing the four hills from each individual together so that it will make a thousand piles. Now, carefully go over each and throw out all the poor hills. Put all the good ones into individual bags or weigh them in the field, probably 10 will be found to produce a heavier yield than any others. These should be kept by themselves and all of the crop planted in a row, so that we have 10 rows, each planted with the progeny of one individual. If they continue to yield well these can be saved, but probably one or two may loose in vigor. They will need to be dropped. Those which hold up can be kept and put into a multiplying plot until enough can be secured for seed. If this be kept up each year one will increase the productive power of his strain of potatoes. It has been shown by this means that the yield can be increased considerably. There is one difficulty which immediately comes in in regard to the fruit grower turning potato grower. He probably intends to be a fruit grower and is merely using potatoes as a stop-gap for a little while, and therefore, it does not appeal to him to go ahead and reach the summit of the potato-growing profession, and it may not appear to be worth while to undertake such a piece of work as this outlined. This is one of the difficulties of the situation and one of the reasons why I feel that I cannot look after more than one or two things and need to contract rather than spread myself out over more. To be a success all one needs is to be able to grow one variety of one crop better than anybody else.

There is one other problem, that is the securing of a good saw for pruning. We have had considerable difficulty but think we have a good tool now in the No. 20 Disston Pruning Saw. It is a modified No. 7 Ship Carpenter's Saw, which this firm has kindly changed at the suggestion of myself and others. We think it is a good tool. At the point it is but an inch wide, the back is hollowed; it is 26 inches long and has the largest handle ever put on a saw, so that a man can use it with his mitten on his hand.

Adams County Strawberries are Beautiful and Delicious.

CO-OPERATION IN MARKETING APPLES.

Hon. S. L. Lupton, *Winchester, Va.*

Your president has invited me to talk to you this afternoon on "Co-operation in Marketing Apples," and, as on day before yesterday, I think I will ask to modify the program and call my talk, "Co-operation in Orcharding." Co-operation extends all through the business of orcharding, not only in the marketing of the fruit but in the growing of the orchard as well. I do not know just why your president wanted this discussion this afternoon unless because you have failed, in your attempts at practical organization as we have done in Virginia, or unless you have tried and succeeded, as we have not done in Virginia. Mr. Cohill thinks the small apple grower will be put out of business by the large company or syndicate orchards. I believe that, if his business is properly managed, the small fruit grower will, in the future, raise the best fruit and secure the larger returns, provided he secures proper organization.

There is quite a difference between fruit growing and ordinary farming. Most farmers consider fruit growing, to some extent, as a side issue. In the first place, if any of you gentlemen have 50 bushels of wheat or a load of corn to sell, you bring this grain to the market and you are certain to get the market price for that produce. You know the price of timothy hay. No matter how small your crop may be, and no matter how little pains you have taken to ascertain the price, you get the market price. That is not so in fruit growing. You raise your crop of fruit and you are ready to sell it, then it becomes at once a battle of wits between you and the buyer. You are at a loss whether to store, to sell it to a local buyer or ship it yourself. You have no notion where or to whom to ship. When you decide where to send the fruit you will likely strike the lowest market.

Let us see in what way a fruit growers' organization can help us leaving out of consideration for the moment any question of selling the fruit.

A number of you may be planting trees in the near future. You have no co-operation.

Each man is selecting his own orchard site and his own trees. What mistakes is he likely to make? First the mistake of location. What way could co-operation help the orchardist in selecting a location for his orchard? I take it that perhaps you may have 150 acres of land and that you probably wish to plant part of that land in fruit trees. Whose advice are you going to take? It seems to me the question of location is such a very serious matter that it is going to involve your whole career as a fruit grower. If you have expert advice here in your county, well and good. The chances are, however, that you do not have. Perhaps some of you do not agree with me in what I am about to say, but in view of the grave mistakes that I have made, I am very slow in taking any serious steps in advance without the advice of the Department of Agriculture, or the Experiment Station. Are you able as individuals to secure the services of an expert in soil conditions to come here and locate your orchard for you? You *would* be in position to secure such advice if ten, twenty or fifty of you need his services at the same time. You could not secure such help without an organization.

Suppose, again, after selecting the site of your orchard, you are troubled about where to buy the trees. What you are most interested in is getting a sound, healthy tree. You are pestered to death by people who want to sell trees. You do not know whether to buy from a local nurseryman or from a nurseryman outside of the county or state. What are you to do? Send for an expert again. Have this gentleman go to the nursery and select the trees. The large fruit grower can afford to do this. The small fruit grower cannot.

I have been extremely fortunate in this regard, having spent the last twenty years in Washington. I have been able to secure the help of these men in my own individual work as I could not have secured it otherwise. The Government has a small experimental orchard plot on my place, where they have been experimenting three or four years. They tell me what fertilizer is to be applied, the cover crops to be put on the land and tell me how to treat the trees.

The result of that experiment on my place has been an eye-opener to me. A year ago the fruit growers in the immediate neighborhood around Winchester held a field meeting in my orchard along in September. It was a most satisfactory meeting, and we were very much gratified indeed, that a great number of ladies came out from the city of Winchester.

When Dr. Waite wanted the experimental block in my orchard I told him I would rather he would take some other man's orchard, because I did not want to be bothered. But, owing to certain conditions he thought he found there, he wanted to secure my place. The benefits have been so far in excess of any trouble that it would not do to mention it. After that meeting our fruit growers began to see things.

After we started picking apples it occurred to me to try an experiment. Our apple pickers, about fifty in number, were just ordinary laboring men, some could not read or write. Men who came down out of the mountains to help pick apples. I said to Dr. Waite, I am going to get all my laborers over here and let you lecture to them just like you did to the fruit growers. Dr. White has a very peculiar facility for expressing himself, so that any sort of intelligence can understand him. When the lecture began I saw at once that the men were intensely interested and every one of those men are better apple pickers to-day from that experience. They asked intelligent questions and seemed to understand what was going on. So much for expert information.

The small fruit growers get anxious about selling, they do not know what they will get for their fruit. They want to sell just as soon as they can. One of my neighbors will sell his apples on the 20th of August no matter what the price. If three or four more do that it breaks the market for the rest of us. It is customary with us to sell the fruit on the trees before picking time, usually contracting for the sale in August or September.

One year when ten or twelve of us had about 25,000 barrels, and we tried to organize, all we could get the growers to do was to sign a paper agreeing not to sell their apples before the first of September. After seven or eight or ten of us had signed up controlling 20,000 or 25,000 barrels of apples, we carried that paper around the neighborhood to get some others not to sell their apples. The other growers said "No, we will not do that. We won't sign up with you because we may not be ready to sell when you are ready and we do not know whether we want to take the price you do or not."

Then everyone of those small growers subsequently did individually, what they refused to do collectively, that is they said, "Those fellows have a big lot of fruit tied up until September 1, and we will just wait until they sell and we will get just as much as they will and not tie ourselves up either." Nobody did sell until after the 1st of September. There were 60,000 barrels of apples sold on that one day. When the buyers had bought our apples they claimed to have enough apples, did not want any more. Then there was a stampede amongst the little fellows. They could not sell their apples at our price and the majority had to sell for considerably less than the apples we sold on the first of September. We received $3.50 to $3.65 in the orchard, and some as high as $4.00 to $4.25. We got a good, round blessing on account of our combine, and could not get a single man to sign up this year.

Another thing happened that ought to be interesting. A gentleman came to see me at Washington, to organize an association of fruit growers. The result of his visit to me was the organization of what has since been known as the Virginia Fruit Growers Exchange. About the same time there was organized, in the upper end of Virginia, the Shenandoah Fruit Growers' Association. Between those two associations, the one in the upper end of the valley, and the one in the lower end, there was 100,000 to 120,000 barrels of apples tied up. The result of thist co-operation was that the apple prices sprung from $2.25 and $2.50 to $3.00 and $4.00, although the two organizations really controlled very little fruit.

You gentlemen are very much interested in spray materials at this time. I found you talking exactly like our own people talk. One gentleman was asking the price of some brand of material. Another was asking what his neighbor was going to pay for "Scalecide." Another one what his spray machinery was going to cost. So many people talking about the price of things and so few about the value of things. I wish our people would talk more about the value of things and less about the price. Fruit growing is not a cheap man's job. Why could not an organization help us in buying our spray material and machines.

One of the things all of us of this section need most, is the co-operation of an organization that will confine us to a standard pack. Let us forget that we are going to sell this fruit at all. Get up a series of co-operative organizations. Have delegates of every organization meet together and decide what the apple pack would be.

Down in Virginia the apple buyers come from New Orleans and New York. Ten or fifteen were there in one season. Six were there yet when I left on Tuesday, of this week. One man came bringing five or six men with him and planning to hire fifteen or twenty more. Before we knew it he had picked up six, eight or ten of our best workmen, and boomed the price of our labor. It has gotten so now that it is difficult to get experienced help because these apple buyers pick them all up. An efficient organization could own or at least help this situation.

I believe I am the only grower in Frederick county who does not have a man representing the buyer come in his orchard to superintend the packing. Under no circumstances will I have another man to come in my orchard to superintend my work. So far as I know, every man in the country permits a buyer's representative do this work. Please consider that these questions have nothing to do with the price. Forget price for the moment and remember that if we grow the right sort of fruit and put it up right it will sell itself.

We know what a tremendous development in fruit growing is taking place out in the Pacific Northwest. It may be a great deal bigger from this point than if we were out there, but we know something about the character of their fruit, and the only thing that makes fruit growing possible in that country is the close effective organization they have perfected.

The object is to put the small fruit grower on the same level with the large one, and by combining to standardize the packing and grading of fruit. I am quite sure that there is no sort of disposition on the part of any of our people large or small, to be jealous. We should get together for the one purpose of standardizing fruit packing and packages of this whole eastern country, and you can't help but succeed, you can't help but realize the profits from such an organization. I do not know anything that has so injured the fruit business as the disposition, not only of the growers, but the buyers who are just as bad, to deceive the public by putting good apples in the end of the barrel and bad ones in the middle. I never saw a barrel of apples fixed up in that way until some fruit buyer showed me how to do it. Please understand that I do not claim to be any better or more honest than my neighbor. This is not so much a question of morals as of plain business common sense.

Last year I had a printed guarantee put in the package. The apples were uniform throughout the package and so guaranteed. I made a bargain that it was to be done that way yet during the picking season the buyer came out to my orchard a half dozen times insisting on my not putting that guarantee in the barrel. He said my apples were no better than other peoples apples, which was probably true and that the guarantee would interfere with the sale of the fruit he bought from other people. Maybe this will be true also but the guarantee goes in the future.

It is going to take a year when we people here in the East, can't get but 75 cents or a dollar per barrel for our apples, and perhaps not that to make us organize. Then we will begin to sit up and take notice, but as long as we can get good prices for our apples then we are going to feel as independent as we have been feeling. But you certainly can get together on these other propositions that I have mentioned. I do not want to take up too much of your time because there are other gentlemen to speak, but let me express the hope that you will not understand or think that I have come to Pennsylvania to teach you a lesson. We have been in the business longer and the truth of the matter is we are having too good luck. We would be better off, in some respects, if we did not have such good crops and such good prices, although I cannot say that I hope there will be a change in this respect. I have come here simply to tell you our own troubles, and I could like nothing better than to have some of you gentlemen to come down next year and tell us you have an organization that is doing something, doing good work. If anything that I have said can hasten that moment and bring it to anything like a success, you will rise up and call me blessed in the lean years which are sure to come and which without organization will find you unprepared when they do come.

C. J. Tyson. I think we owe Sen. Lupton special thanks for his address and hope that we are going to take it to ourselves and get a lot out of it. The experience he had along the line of guaranteeing the pack is one that will work out splendidly. We have been using a similar arrangement for five or six years, stamping a guarantee on the head of the barrel. It has brought back inquiries for fruit and has worked nicely. If we start in with a determination of that kind it is going to lead to our putting up fruit that will do as much for us as any co-operation we could get up.

Question. Can you get experts in Virginia to pack apples in boxes?

Mr. Lupton. We had, in our section this year, some few expert apple packers. Some of them were very satisfactory and some were not. Some had worked at Hood River. I wish that, if you people have an apple crop, ten or twelve of you would get together and hire an expert apple packer, and try the box package in a small way at least.

Question. What would such a man cost?

Mr. Lupton. We paid our man $3.00 per day and expenses. I think, to many of us, it was well worth the money, and I have seriously thought of sending or going to Hood River and getting an apple packer to come in here and pack our barrels. We had some men who got interested and there was a marked improvement in their work. The difficulty was in finding men who wanted to try to learn to do these things.

Question. Do you have native help who can pack in boxes?

Mr. Lupton. Very little. The apples that I brought here were packed by a packer from Florida. The best day's work he did was 80 boxes. Did it all himself. The apples were run through a grader made by him. He had them graded in three sizes and claimed he could pack 100 boxes a day, and did pack 80 boxes in one day.

Question. Do you put only one grade of apples in a barrel?

Mr. Lupton. We try not to pack two grades in the same barrel. I presume our methods in this respect are similar to your own, that is No. 1 fruit to be 2½ inches and up and No. 2 fruit below 2½ inches down as small as we can sell them. It has always been thought that it is impossible to grade apples with a mechanical grader, but I believe it can be done. It is certainly not convenient nor proper to have women and girls help us if we continue to pack in the open, as we now do, and I think in the future we will have to build packing sheds and do our packing under cover.

Question. How far do you think you can haul the fruit to be packed?

Mr. Lupton. I have 200 acres in one block and will put a packing shed in the middle of the orchard. If I could put a central plant at the railroad station the question might be solved. I understand, from several sources, that is being done in some cases. Hauling the fruit to the station to be packed would be all right if not too far and the roads were good.

Apples From Unsprayed Trees. Large Pile, Culls. Small Pile On The Right, Saleable Fruit. (Photo by Peairs.)

SPRAYED ONCE WITH ARSENATE OF LEAD AND BORDEAUX MIXTURE.
LARGE PILE NOT WORMY (SALEABLE), SMALL PILE WORMY.
(Photo by Peairs.)

PEACH GROWING IN MARYLAND.

AARON NEWCOMER, *Orchardist, Smithburg, Md.*

I would like to ask how many peach growers there are in the audience. Please hold up your hands. Quite a few. I want to say this, but not in the way of flattery, if you can grow peaches as good as the apples you have here on exhibition you have a fine peach country. It looks to me as if you have good peach soil, one that will give the fruit high color and excellent quality and that is the only kind that it pays to grow. I have been growing peaches for about eight years. Naturally some mistakes have been made but I feel that we have learned some things that are of value to us. They may not apply to your locality.

Location as to Elevation.

In selecting a site for a peach orchard I would first consider the elevation. I prefer an altitude of from 725 to 1,000 feet above sea level.

Member. Where would you go to find that elevation?

Mr. Newcomer. In any mountain section.

Member. Do they not grow good peaches in the low sections of Delaware and New Jersey?

Mr. Newcomer. Yes, but New Jersey has conditions which we do not. The ocean breezes temper the atmosphere. It does not get as cold there as it does here. We can grow peaches almost anywhere but we cannot produce the large, beautiful, high quality commercial peach with any success under 700 feet. I prefer an elevation of from 725 to 1,000 feet.

Soil Adaptation.

Another important matter to consider is soil conditions. For myself I would want one of three soil types; either sandstone with a clay subsoil or a black slate with clay subsoil, or a deep chestnut slate soil with a mixture of sandy loam and clay as a subsoil. I believe peaches will *not* do well on a rocky shale soil. I do not mean that peaches will not grow on other kinds of soil only that I have found the ones mentioned best for me in the order named. I traveled in five states two years ago prospecting for peach soil and finally came back to our South Mountain district. We have the best soil and the best elevation. Peaches can be grown in the southern states but they do not have the flavor of ours. It is understood by a great many people that peaches will do best on a poor soil. I prefer the best I can get of one of the types mentioned. It is possible to grow peaches on poor soil by fertilizing pretty well and growing lots of cow peas, crimson clover or red clover as a cover crop to turn down, but if the soil is naturally rich we avoid that expense.

Preparing Ground For Planting.

I like to plow the ground deep, 8 to 10 inches, being careful to do a thorough job. It is then well harrowed with a spring tooth harrow, until a good seed bed is secured. The field is scored one way with a shovel plow making the furrows 17 feet apart. It is then marked out the other way with a barshear plow with furrows 20 feet apart setting the plow to run as deeply as possible. The trees are set exactly on the cross mark. Quite a few growers plant closer than 17x20 feet but we have learned that a closer planting is not best. One of my orchards was set 17x20 and another 18x18. We find the 17x20 best. It is covenient to spray and cultivate and later will have plenty of air and sunlight.

Selection of Trees.

It is quite a problem to know where to get exactly the kind of trees you want, of the right variety, true to name, healthy and vigorous. You should know your nurseryman. I prefer a tree 3 to 4 feet or an early budded, June bud 3 to 4 feet if it is grown in the southern states or southern nursery. Examine your trees carefully before planting to see that they are healthy and of right kind. You cannot always tell about the kind but can almost always distinguish between a white and yellow peach, by the bark. A white peach will have red bark on one side and dark purple on the other, while a yellow peach will have a rather bright yellow bark on one side and a reddish-brown on the other.

Varieties.

If you are planting a commercial orchard in Adams county or in Frederick or Washington counties, Maryland, and wish to have a succession extending over a period of about 60 days I would not select over 8 to 10 varieties. If possible you should have enough of a variety or be able to combine with a neighbor so as to make enough to ship carloads. To do this, if you have 1,000 trees of a variety you can pick over 500 of them on alternate days. You can always do better in selling at home or in shipping if you have carloads. With only local lots you are at the mercy of the commission man unless as suggested before you can co-operate with neighbors to load full carloads. I think co-operation is one of the important things for the orchardist. Then if there is a good man at the selling end he can divert the cars after shipping and place them where they will bring the most money. For a succession I would use Greensboro, Carman. Hiley, Champion, Slappey. Belle Georgia, Captain Ede, Elberta, Late Crawford, Mathews Beauty, Munson Free, Fox Seedling, Geary's Holdon, Klondyke, Salway and Iron Mountain. Salway does well high up on the mountain slopes where it does not mildew. Do not plant September peaches below 750 feet elevation if you wish success.

Pruning.

Before planting I trim the roots that are broken and cut back those that are very long so as to make them uniform, always being careful to make the cut slanting on the under side of the root so that the cut surface will come into contact with the bottom of the furrow. It will callous over more readily and soon send out small feeding roots. If trees are planted in the Fall we do not trim tops till the following spring. Spring planted trees are pruned as soon as set. If a low-headed tree is desired, cut back the main stem to ten of twelve inches. If a high-headed tree is preferred cut to 28 to 30 inches. As the tree grows during the summer cut off all but 3 or 4 of the main branches which should be used for the future frame work of the tree. These main limbs should be trained to grow as nearly at an angle of 45° as possible, then the trees will be easily sprayed and the fruit can be nearly all picked from the ground without the use of a stepladder. All centres should be kept cut out to admit sunlight.

Cultivation.

The first and second years after planting the orchard, I plow it with a barshear plow following with spring tooth harrow and plant to corn, potatoes or cantelopes, to make the orchard self-supporting till it comes into bearing, which is usually the third year after planting. The following years, when the orchard is in bearing, we give only shallow cultivation with a spring tooth or disc harrow. This cultivation commences as early in spring as possible so as not to endanger bloom and tender fruit, in case of cold weather. We cannot begin much before March 20th without danger. On one occasion I had part of an orchard harrowed when the weather was cold and had a lot of damage on the cultivated part and none on the other portion. The cultivation seemed to lower the temperature to the danger point. We continue the cultivation every four or five days until the 15th of July. In this way a fine crop of peaches can be grown and a lot of strong hardy fruit buds developed for the next year's crop.

Maintaining Fertility.

I believe in fertilizing the trees well. A fertilizer which contains 2 per cent. of Nitrogen, 8 per cent. of Phosphoric Acid and 10 per cent. of Potash seems to be a good balanced fertilizer. I use from 500 to 1,000 pounds of this mixture per acre annually, commencing the second year after the orchard is planted. As a cover crop and to assist in maintaining fertility I use crimson clover, winter vetch and cow peas. These add much in the way of humus or vegetable matter.

Spraying.

As a remedy for San Jose scale I would use home-made Concentrated Lime-Sulphur solution—15 pounds Sulphur, 20 pounds Lime or some good brand of Concentrated Lime-Sulphur made by a reliable firm. I tried Scalecide and Target Brand Oil on a large scale and it nearly put us out of business. Quite a lot of trees were killed and a lot more were injured so that it will take some time for them to recover. You cannot grow peaches without spraying them well. As a summer spray for fungus diseases we have been very successful with Bordeaux mixture—2 pounds Blue Stone, 6 pounds Lime to 50 gallons of water. We are thinking of trying some home-made Concentrated Lime-Sulphur the coming summer.

Thinning.

We always thin the fruit hard. One year took off over 4,000 bushels. We were at it three weeks. The neighbors said, "Newcomer is a crank," but we had nice fruit. By thinning the fruit so that peaches are from four to six inches apart on the limbs we grow fine large specimens for fancy packing which bring highest prices. If you are doubtful as to the wisdom of thinning try it on six Elberta trees leaving the next six unthinned and note closely the result at picking time. The improved condition of the present crop is not by any means the only advantage of thinning. Perhaps the most important of all is the protection of the tree against breaking as it is almost sure to do when overloaded, and against the robbing of vitality which would impair its future usefulness. Do not wear out your trees by allowing them to over-bear.

Picking and Packing.

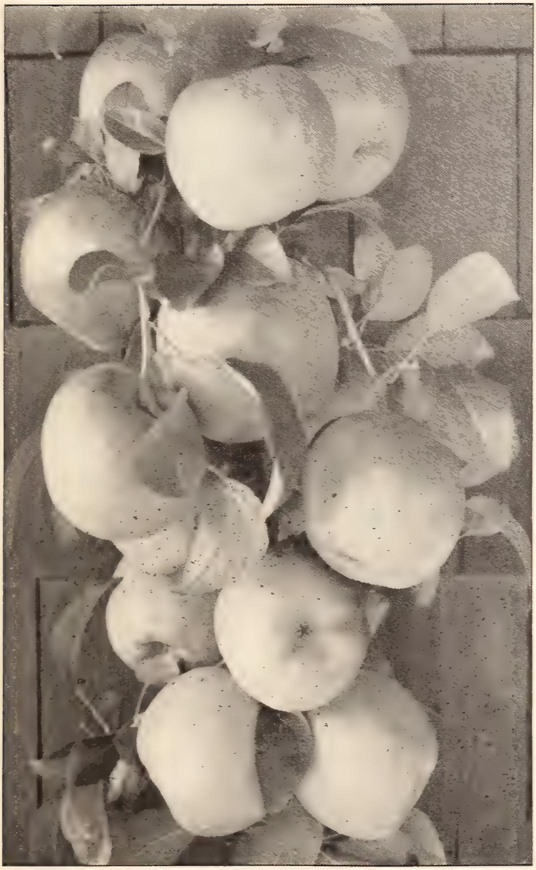
When harvesting the crop, all fruit is hauled to the packing house. I very much prefer ladies to do the packing. Would not give a cent for a man to pack peaches for me. Never saw a grower yet who could pack peaches like a lady. She has more taste and neatness about it, and will put up packages that will sell for more money every time. We use the half-bushel Delaware basket and the Georgia Carrier. All fancy and extra fancy grades are packed in carriers.

Member. Do you use a grading machine?

Mr. Newcomer. If the peaches run clean of rot and defects the grader works well. Otherwise hand grading is best.

Member. Does not Salway mildew and crack?

Mr. Newcomer. Salway does not crack or mildew on high elevations, 800 to 1,000 feet.



How the York Imperial Grows in Adams County
(Every Apple Perfect.)

SOILS OF THE SOUTH MOUNTAIN DISTRICT AND THEIR ADAPTATION TO VARIETIES OF APPLES.

H. J. Wilder.

It is difficult to describe in a half hour's time the adaptation of various kinds of soil to the many varieties of apples. We are not accustomed to talk about the soil even though trying to get our living from growing crops in it. We are not yet in the habit of thinking in soil terms. Some day we shall do this. And the growers of special crops, the fruit growers, the vegetable growers, ets., will be the first to realize the need for so doing. The numerous requests for soil facts that come to the Bureau of Soils from leading orchardists indicate that the desire for a much more intimate knowledge of the soil is already here. But meanwhile it is no easy matter to come at once to a common understanding so that a given statement means the same thing to all of us. So today I am going to talk first about soils in general leaving the matter of type adaptation until later.

In studying soils, as in other things, we begin by making a few large groups. This is commonly done by classifying the rocks from which the soils have been derived. Thus we have limestone soils, sandstone soils, shale soils, granitic soils, etc., and in that part of the South Mountain district in this immediate vicinity you have many finer divisions, even, such as "white flint," "gray flint," "copperstone," "mountain stone," etc. A group of soils is designated by the soil series name. Thus the valley limestone soils were named the Hagerstown series because they were first mapped in the vicinity of Hagerstown, Md. And in similar manner other names have been selected to designate main groups or series of soils.

Leaving the stone content and the gravel content out of consideration we are accustomed to speak of soils as clays, sands and loams, or some combination of these terms such as sandy loams, clay loams, etc. What do these terms mean? Analysis of a true clay will always show that the per cent. of exceedingly fine particles is relatively high and where the amount is as much as 35 per cent. of the soil mass it gives to the soil a definite character, in fact seems the determining factor in the way the soil behaves when worked. If plowed or cultivated when wet such a soil will clod badly. Soils are sometimes found which analyze as much as 50 per cent. of clay, but I know of none so heavy in this state. A soil that would be mapped as a sand, on the other hand, is composed principally of particles much coarser than the grains of clay. Through such a soil water percolates rapidly and we think of it as a drouthy soil. Between these two extremes, then, of sand and clay, the coarsest soil particles and the finest there is a wide range of sizes. A true loam is a mixture of a large number of different sized particles. It is a medium mixture in which clay, medium and fine sands and silt are well balanced. When there is a little too much sand for this medium mixture of loam the soil is called a sandy loam, but where there is a little too much clay for the same classification the soil is called a clay loam. This phase of classification, as you will note, is based solely on the size of the soil grains, and determines the so-called texture of the soil.

But there are also stiff soils, mellow soils, mealy soils, and so on. This is brought about by a difference in the *arrangement* of the various sizes of soil particles. Two soils may analyze practically the same, *i. e.*, their textures may show no material differences and yet after a rain the one has to be dried out much more thoroughly than the other before it can be worked without clodding. This is due to the differences in the soil structure. Suppose we reduce this to fractions having a common denominator, as we used to do in school. Some of you have tried packing apples in boxes, and until experience has been acquired it is not easy to come out even. If all apples were of the same size it would be an easy matter. But there are all sorts of variations in size, and it takes patience to work out the best combination. Apples of different sizes have to be arranged to fill a given space, and there is almost no limit to the number of combinations that could be made if we did not assort and pack according to standard grades.

Now soil particles vary as much in size, relatively, as do apples, and hence the soil mixture is exceedingly uneven. All sorts of combination packs have been made and in some of them the particles fit together so snugly that they do not readily crowd apart when a little rootlet tries to find its way down among them. And remember that in plant and tree growth a tiny rootlet always has to blaze the path downward into the soil, the big strong root being a later development. Stiffness, or its opposite mellowness, depends upon the *arrangement* of the soil grains and not upon their *size;* upon the structure, not upon the texture of the soil.

Contrary to common opinion the most clayey soils are not the stiffest soils. Bricks are not made of clay alone, but of a rather definite mixture of clay and particular grades of sand. Sometimes we find subsoils that approach in varying degree a bricklike composition. If brought to the surface by the plow, exposed to the air and left undisturbed for a short time the clods bake, and then are reduced with much difficulty. This could be prevented at the surface if the harrow had followed the plow closely, and if stable manure or other organic matter had been mixed with the soil, but a deep subsoil of this sort is not so easily improved nor is it inviting to a well-branched fibrous root system. The root systems of some varieties of apples, furthermore, overcome a stiff structured subsoil much more successfully than others. In one of the large orchards of the southern Ozark country Ben Davis trees failed in certain spots. They were very unthrifty and not infrequently died. Yet elsewhere in the same row, with identical slope, exposure and treatment the trees were in excellent condition, and bore heavily. The owner believed, too, that there could have been no variation in the stock. An examination of the subsoil showed it to be exceedingly stiff wherever the trees were effected. Following this cue throughout the orchard it was found that another variety (Mammoth Black Twig) was not effected at all by the stiff subsoil as the roots forced their way down through it, and the trees showed excellent growth. Not satisfied that the chemical condition of the soil in this case might not have some influence upon the unthrifty trees I had made chemical analyses of these soils, but the results showed that there were no chemical differences worth noting. In this particular case it was apparent that the Ben Davis would not thrive on so stiff a subsoil, whereas the Mammoth Black Twig could successfully overcome it.

I do not need to call your attention to the self-evident fact that the condition of this subsoil was not amenable to practicable improvement by the addition of humus, notwithstanding the fact that by this means surface soils may to some extent be changed. In a less pronounced case the growth of deep-rooted crops such as the legumes would have greatly improved the physical condition of the upper subsoil, but once the orchard is planted, or at least after it has reached bearing age, the practical orchardist will hardly try to leave cover crops under his trees so many months of the growing season that their root systems will be sufficiently developed to add humus to the lower subsoil. Yet the roots of a well-developed apple tree reach far into the subsoil.

The roots of plants and trees do not get their moisture from free ground water, *i. e.*, water that may flow out in surface streams and underdrains, but from the thin films of moisture that surround every soil particle. This moisture is called capillary water. A tree can get no plant food from the soil except as it is obtained in dissolved form, not in free ground water but in the soil film or capillary moisture. Hence the importance of the texture and structure of the subsoil, as well as that of the surface soil is at once apparent.

I have indicated some of the main factors considered in the study and classification of soils. When studying soils in the field we follow out the crop results as related to and depending upon the soil conditions. Thus we are enabled to compare crop results as influenced by a large number of soil variations and to draw some conclusions in regard to the adaptation of certain soils to certain crops and to different varieties of the same crop.

Having dwelt at some length upon the importance of soil selection, I want to call your attention at this point to the fact that the character of the soil upon which a crop is grown is only one of several factors necessary for successful crop production. Climatic conditions embracing not only absolute temperatures, but also the rainfall, air drainage, soil drainage as influenced by topography—the only kind considered until recently— elevation both above sea level and with reference to local topography, fertilization, and care of orchards are all important. No one of these factors may be studied effectively unless the other factors influencing production can be balanced. So soil comparisons can only be of value when the other conditions are equalized, and to do this a large number of field comparisons is essential. The adaptation of varieties of apples to types of soil can be studied with hope of arriving at definite results only by considering first the behavior of specific varieties upon specific well-defined types of soil.

In the South Mountain region you are somewhat restricted in the number of commercial varieties of apples that have proved to be both hardy and profitable, and that possess at the same time as good quality as a group of growers of your standing wishes. There is nothing strange in this for until recently we have always been satisfied with whatever varieties we might have, hence little effort has been made to test other varieties under local conditions. Barring a few sections in the eastern United States which seem to have been blessed with varieties to fit their conditions without much effort on their part, growers are seeking to-day additional varieties that will yield well and also be of high quality. York Imperial has been the money-maker in your district, and until you have more profitable sorts of better quality than you now have, it must continue to occupy an important place in your commercial plantings. The York apple has been severely arraigned because of poor quality, and as sometimes grown the reputation is in some degree merited; but on the other hand, it is a very good apple when grown at its best, and at least has nothing to fear from such as the Ben Davis group.

If the tendency of the York to be coarse in texture could be in some degree overcome an important advance would be made. As grown in some parts of central Pennsylvania where the climate is a little colder than in the southern part of the state its texture is much finer, and in following this variety to its northern limits where superseded by the New York varieties, the flesh is much closer, more solid and compact than with you, but the apple is not so large. There are several good sorts moreover, to take its place there and so it is not planted to any great extent. You cannot bring that climate here, but you can select those subsoils which have such water holding capacity that their temperature will make up in part for those climatic conditions, and thus be of material assistance in growing a finer textured York apple.

Dr. Voorhees in an address to the New Jersey Horticultural Society last year (see page 153 of New Jersey Horticultural Society, 1909) said he thought color to be largely dependent on climate and sunshine, but to some extent the presence of iron might assist. In hearty accord with this it seems to me that attention has not been called to one of the most important factors, unless Dr. Voorhees meant to include it under the general heading "climate," and that hardly seems probable. There are certainly two conditions of climate in which every tree finds itself trying to grow, viz., the one above the surface of the ground and the other below. The former is much easier to observe than the latter, and to it much thought and study have been given. But soils vary greatly in their capacity to hold water, and this variation depends largely upon the texture of the soil, *i. e.,* upon the size of the soil particles.

But the structure of the soil also plays an important part in determining in many cases the moisture conditions, though that is not necessarily its most noticeable effect on tree growth. Soil temperatures depend largely on the water-holding capacity of the soil. The soil particles warm up in the spring much more readily than the water contained in the soil. So does the humus, but the relatively small percentage of it in any good fruit soil makes it a factor of lessor importance as far as its temperature is concerned. Consequently a soil that holds the most water is the last in the spring to become warm enough for the planting of crops. Hence we commonly call a sand a light soil because it is ready to work early in the season, whereas clay is considered a heavy soil because it retains moisture well and cannot be worked until later. As a matter of fact, the opposite is true so far as the weights are concerned, a given volume of sand weighing more than an equal volume of clay.

If, then, subsoils well-drained from free water be selected within the York region that carry a maximum of capillary water their temperatures will be sensibly lower, especially during the mid-summer months, than those of lighter textured subsoils that carry less capillary water. In this way slight check to rapidity of growth may be effected and thus give to the fruit a somewhat finer texture.

To obtain, then, the best quality of York Imperial consistent with heavy yield and good exterior appearance this variety should be planted, I believe, on a heavy well-drained soil. A mellow clay loam surface underlaid by clay loam or even clay in this region, so long as it is not stiff enough to prevent the ready penetration of the roots, would be particularly desirable. The elevation of South Mountain above the surrounding country is undoubtedly a desirable factor, though its superiority over the lower slopes of the same range could hardly be very marked where the soil conditions are equalized.

There are no soils in this vicinity too heavy for the York Imperial. Hence I would suggest that the heaviest or most clayey soils be selected for this variety, where drainage is good and at the highest local elevation available. The Cecil soils as mapped in the Adams County Soil Survey, especially in the northern part of the county, the heavier parts of the Porters loam and the Porters stony loam, the Mont Alto loam and stony loam are very desirable, and the heavier members of the Leesburg, the Duffield, the Hagerstown and the Penn soils where the elevation is sufficient are also good, ranking in the order named. The Mont Alto, Leesburg and Duffield soils were not mapped in Adams county, but they occur not far north and west of South Mountain, and have been mapped this season on the Reconnoissance Soil Survey of South Central Pennsylvania.

The Stayman is so near the crest of popularity at the present time that it is being planted extensively in many parts of this state regardless of conditions, either of climate or of soil. It is undoubtedly a very desirable acquisition to the list of varieties suited to this immediate vicinity and in general to southeastern and central Pennsylvania, but I doubt whether it is any more cosmopolitan as to soil and climatic conditions than several other well established sorts, such as the York and Baldwin.

The Stayman has given its best results, as observed up to this time, on soils of medium texture that are not above the average in productivity, and on medium to heavy sandy loams. The tree is naturally strong in growth hence its vegetative habit should not be intensified by an excessively rich and productive soil. The color of the fruit is very liable to be deficient, hence moist rich loams and clay loams should be carefully avoided. The variety has shown a tendency this year to crack open just ahead of picking season, and while the damage has not been heavy, neither is the indication reassuring. Very likely this tendency is due in part to weather conditions of the present season, but I want again to call your attention to the climatic conditions maintained by the soil and subsoil, especially the latter, and that the roots of a tree are in a very definite climatic environment which is locally controlled largely by the water-holding capacity of the subsoil. The latter in turn depends principally upon the texture and structure. The bursting of apples on the tree is generally attributed to a too rapid growth, except as it may be a varietial tendency. Early seasonal growth is obtained on sandy soils, but the strongest vegetative growth the season through is obtained from rich moist loams. From such soils large apples may be obtained but the color is inferior. For these reasons, then, would I select soils for the Stayman as previously described. In the Porters soils the lightest areas that are also the most thoroughly drained are to be preferred. The highest elevations in the Penn loam and Penn shale loam should also give very fair results. Where Mont Alto soils are to be used the lightest of this series available, or the heavier areas where well drained, will undoubtedly give a well-balanced growth of tree and fruit. On the other hand, the Mont Alto soils of medium texture that are more highly productive seem especially well adapted to Grimes, a variety that needs encouragement in tree growth. The Porters and other soils a little heavier are also adapted to this variety. Grimes seems not sufficiently vigorous to overcome a stiff subsoil, although the subsoil must be clayey enough to maintain a steady supply of moisture. A mellow or plastic clay loam best supplies this condition, and the fruit from such soils is slightly better in keeping qualities than that from lighter mellow soils. The soil requirements of the Grimes differ markedly from those of the York which will thrive on a much stiffer subsoil than the Grimes.

Jonathan holds a good deal of promise for this section. Its high quality and the strong demand for it when well grown make it a very desirable sort. As grown in the north, that is, in New York and in northern Pennsylvania, at least, its size is somewhat disappointing. In the southern Ozark country it is a magnificent apple. It is the one commercial sort which has been fully tested there that can compete in quality with Pennsylvania apples. In West Virginia it varies greatly in size depending on conditions. The tree has not a strong growing habit, and the further north it is grown the smaller the fruit, when grown under comparable conditions. A deep mellow warm soil such as the so-called Pine Lands the other side of South Mountain—named the Leesburg series during this season's work—is well adapted to the Jonathan. Carefully grown on a soil of that kind I believe a satisfactory growth of tree may be secured, and that the fruit will meet requirements both for size and for color.

Smokehouse is another sort of high quality that grows well on light to medium soils. The soil must be well drained, and if also somewhat porous fruit of better color is secured. Such a soil may be put in a productive condition, but care should be exercised in applying nitrogen as an excess of this element makes it difficult to secure good color.

I will mention three other varieties that seem well worth considering, though I have relatively little data concerning them. One of these is the Arkansas Black which is doing very well in some cases. It is dull in color but is fairly good in quality and has been profitable in some cases in southeast Pennsylvania. For it I would suggest medium to light soils in an experimental way; and similar soils will give very good results with the Stark. W. S. Adams, of this county, has had experience in growing the Stark on the Porters soils, and finds the color rather dull, but when grown at its best the Stark is dull in color, and it is not improbable that it may be grown fairly well in this section, especially on the Pine Lands. It has the advantage of keeping later than most other varieties except the York.

A third variety which has given fairly good results under conditions similar to yours is the Langford Seedling. The fruit is of medium size, red in color though a little dull, and it is fairly good in quality. If one cares for an apple of this type it is worth trying, especially on your medium soils at the lower altitudes, such as the Penn loam, Penn gravelly loam and Penn shale loam.

Good Baldwins are only grown where climatic conditions somewhat colder than yours obtain. These are found this far south only where higher altitudes compensate for the distance south of normal Baldwin conditions. This makes it possible to grow Baldwins at altitudes higher than yours along the Blue Ridge in northern Virginia. In both places it becomes a fall apple and as such is not as desirable as where it remains a true winter sort. In northern Pennsylvania, New York and New England where it is at home, this variety is best grown on deep friable loams and heavy sandy loams with loamy subsoils. Farther south heavier soils are better. I hope you will soon find as a result of thorough tests a sufficient number of good commercial sorts so that you will not need to use Baldwin, and I believe that in time this will be done. It is well not to try to beat the other fellow at his job, and that is about what you are trying to do in growing Baldwins.

Your President asked me to talk about local conditions so far as possible and this covers, I think, your most important varieties.

To illustrate further the range of soil adaptation to specific uses it may be worth while to mention the effect of soil influence on some other crops. In the Connecticut Valley of Massachusetts and Connecticut, for instance, the character of the soil has been the determining factor in crop selection. You will pardon me, I am sure, if I select to illustrate conditions there, my father's farm where most of my life was spent until 21 years old, and where I have been able to follow closely the cropping conditions and management until the present time. It is a long rectangular farm that is typical of soil conditions over a broad scope of territory. Three types of soil are found, as illustrated in the following diagram. (See Fig. 1).

The soils are all alluvial, the range in elevation is in only one case as much as 15 feet, and within any one of the soil divisions the surface is nearly level.

The fine sandy loam at the west end of the farm is the best type of soil for wrapper-leaf tobacco, though worthless for the production of filler leaf, hence a normal price is $150.00 to $200.00, or even more, per acre. It is also a good onion soil but brings no more profitable returns from that crop than the loam at the east end of the farm which, with the same culture treatment gives a cigar leaf so much thicker and poorer in quality that no one longer persists in trying to grow tobacco on it. Hence, a relative price for this soil type is $100.00 an acre, where the location is in every way equal to the other. The silt loam in the middle of the farm is worthless for tobacco, mediocre for onions, and so used almost exclusively for corn and grass. As a result its price is $50.00 to $75.00 an acre.

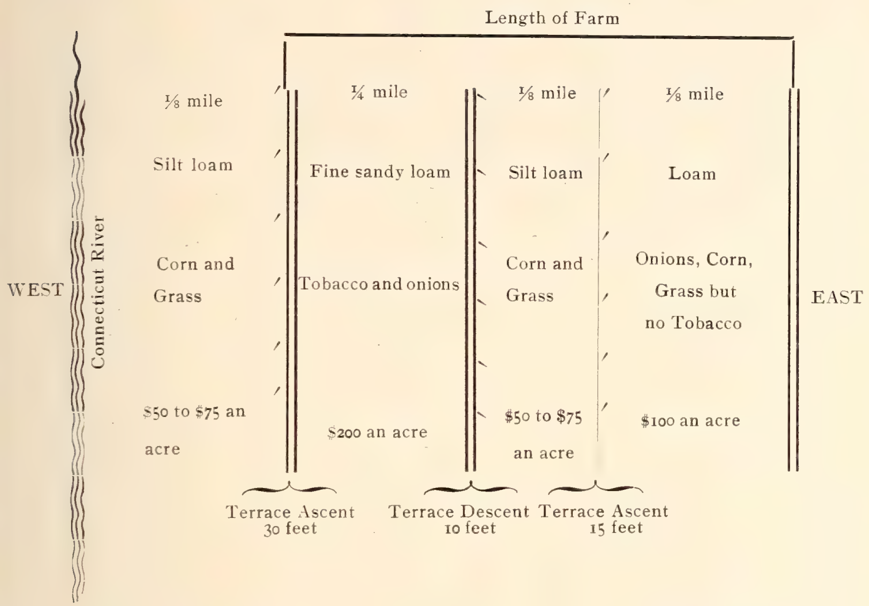


Fig. 1. Showing diagram of farm located in the Connecticut River Valley and including in its extent three distinct soil types. Double lines represent Public Highways.

It should be noted, too, that the best of the tobacco lands contain the very low organic content of 1.5 to 2.75 per cent., notwithstanding plentiful applications of stable manure. Hence the natural adaptation of that soil does not depend, it need hardly be said, on the organic content; neither may other soils of that locality, such as the loam at the east end of the farm mentioned, be so amended by the addition of humus as to produce leaf satisfactory in quality. Yet it is just as favorable as the first for the growth of cigar leaf in every respect save that of texture and structure. Here, then, is a very definite illustration of how the physical character of the soil has not only been the determining factor in the selection of specific crops for the different types of soil on a given farm, and for a linear distance of at least 75 miles in two states, but these specific adaptations to special crops have in turn been the principal basis of land valuation there for the last half century.

This case is not unique. There are many cases in different states which illustrate the same principle of soil adaptation and definite soil requirements for the best results. These are not theories but facts based upon and demonstrated by well-developed agricultural practices.

In view of these facts it does not seem strange that our fruits also should give a wide range of results as grown on different soils, and that equal results with a given variety of apple, for instance, are not obtained from diverse soil conditions.

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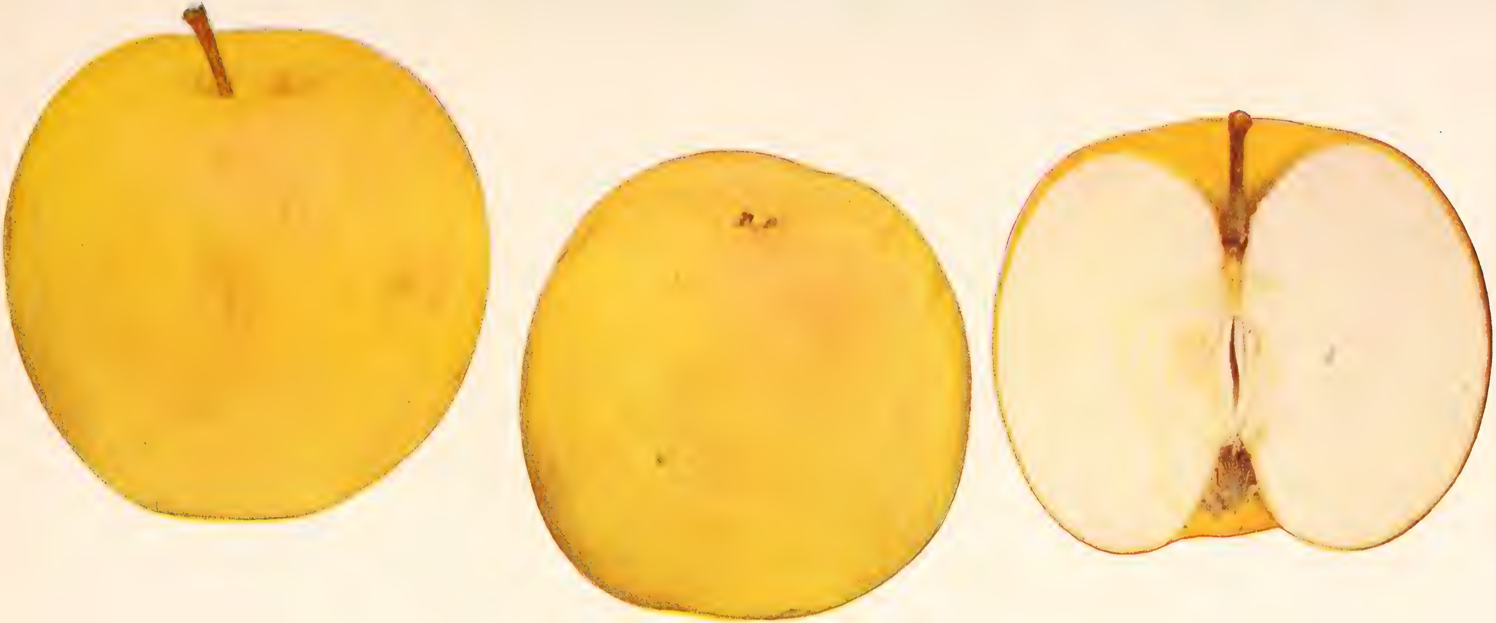

GRIMES

THE ORIGINAL GRIMES GOLDEN APPLE TREE.

Historical Sketch as given by HON. HENRY C. HERVEY in 1906.

The Grimes Golden is a seedling which originated on the farm of Thomas Grimes, situated about three miles east of Wellsburg, on the Wellsburg pike, in Brooke County, West Virginia. Thomas Grimes, Jr., sold the farm about the year 1874 to Dr. J. W. Gist, who was my father-in-law. I have seen the original tree often.

I was chairman of the Horticultural meeting held at Wellsburg in 1896. I met Profs. L. C. Corbett and A. S. Hopkins, of the State Experiment Station, going out to see the tree as I was going to Wellsburg to attend the meeting. When they came back I asked them what condition the tree was in and they said it was on the decline. Councilman told me the other day that it was lying on the ground dead.

I am now sixty-four years old. I remember the tree for at least fifty years. When I was a boy these apples were prized and my recollection is that about fifty to sixty years ago people in this section began planting grafted trees. My father planted an orchard about the time of grafted fruit. At that time people went to Wood's Nurseries, some place in Ohio, from this section in wagons and my recollection is that about that time the Grimes' Golden got into the market and was named Grimes' Golden after the man on whose farm it originated.

Dr. J. H. Funk, of Boyertown, Pa., in "Fruits for Pennsylvania," refers to Grimes' Golden as follows:

"Introducing this variety, Mr. S. B. Marshall, of Massilon, Ohio, conferred a blessing upon posterity that cannot be estimated. This beauty is among the apples what Seckel pear is among the pears—the standard of excellence. Tree vigorous, healthy, spreading and very productive; the tree comes into bearing at an early age. The one weak point in this variety is stem blight or canker; when trees are purchased from the nurseries root-grafted, they are short-lived, seldom living over twenty years; but this can be avoided by top working on some strong growing variety.

"Fruit above medium, cylindrical, regular; surface yellow, vein russetted; dots numerous, minute; basin abrupt, folded; eye large, closed; cavity wide, regular, green; stem long, curved; core small pyriform, closed; seeds numerous. Flesh yellow, firm, breaking, very fine grained, juicy; flavor sub-acid, aromatic, spicy, rich; quality very best; use dessert market. There is such a demand for this fruit that buyers are willing to pay from ten to twenty cents more per bushel from the orchard than for any other variety. Season December to March. Does well wherever tried."

FRUIT EXHIBIT.

The fruit exhibited by members of the Association at this convention while of less quantity than upon some former occasions was decidedly better in quality than that shown heretofore. There was evidence of more careful spraying and less room to complain of lack of stems, polishing, etc., etc. One exhibit of fine fruits which would certainly take a prize for coloring and conformity was woefully lacking in stems and would be ruled out in a competitive exhibit making it necessary to leave it behind when packing the fruit for sending to the state exhibit, much to the regret of the committee. There may possibly be a lack of understanding in the minds of some members as to the reason for judges insisting on stems being present. The stem of an apple is as important as the nose on a man's face when it comes to identification. The various races and nationalities of mankind can frequently be differentiated and identified by the size or shape of the nose. It is the same way with apple stems; some varieties have uniformly long slender stems, others short thick ones. Frequently varieties from different localities differ so much in color that the stem becomes a very important matter in classifying them. Again apples of a different variety sometimes resemble each other so closely in other characteristics that but for the stem they could be used to compete for the same prize.

When saving your fine fruit for the 1911 exhibit PLEASE BE CAREFUL TO HAVE ALL STEMS INTACT. It is entirely proper to wipe fruit carefully to remove adhering dust but should never be rubbed to enhance the gloss as that disturbs the natural bloom of the fruit thus removing another point of identification and a very important one in some cases.

There were on the tables 144 plates and six boxes of apples, four plates of pears, five of potatoes, 3 of walnuts and one of Seed Corn which we identify as follows:

Details of Fruit Exhibit.

B. F. Wilson, 18 plates—

3 plates York Imperial.
1 plate York Stripe.
2 plates Ben Davis.
2 plates English Redstreak.
1 plate Mann.
1 plate Paradise.
1 plate Domine.
3 plates Jonathan.
1 plate Baldwin.
1 plate Smokehouse.
1 plate Smith Cider.
1 plate Pound.

Robert Garretson, 19 plates—

5 plates York Imperial.
2 plates Stark.
1 plate Russet.
2 plates Ben Davis.
1 plate Grindstone.
1 plate for name.
2 plates Yellow Belleflower.
1 plate Winesap.
1 plate Taft Potato.
1 plate Early Clark Potato.
1 plate Snow Potato.
1 plate Burpee Potato.

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W. S. Adams, 9 plates and one box—

1 plate Stark.
1 plate Pound.
1 plate Jonathan.
1 plate Paragon.
1 box York Stripe.
1 plate Baldwin.
1 plate Northern Spy.
1 plate Winter Doctor.
2 plates Sutton Beauty.
Box apples not wrapped.

Joel V. Garrettson & Son, 24 plates—

2 plates Lehigh County seedling
1 plate York County Cheese.
1 plate Black Twig.
1 plate Tariseime Walnut.
1 plate Frauquette Walnut.
1 plate seedling Walnut.
6 plates York Imperial.
2 plates Stark.
2 plates Langford.
2 plates Baldwin.
2 plates Stayman.
1 plate seedling.
1 plate B. Sweet.

E. P. Garrettson, 15 plates—

2 plates York County Cheese.
1 plate Domine.
3 plates Kieffer Pear.
5 plates York Imperial.
2 plates Baldwin.
2 plates Stayman.

Anthony Deardorf, 7 plates—

1 plate Wagner.
1 plate York Imperial.
1 plate Pound.
1 plate Stark.
2 plates York Stripe.
1 plate Smith Cider.

Geo. R. Routzahn, 7 plates—

1 plate R. I. Greening.
1 plate York Imperial.
1 plate Pound.
1 plate Paradise.
1 plate Pippin.
1 plate Wagner.
1 plate Baldwin.

H. M. Keller, 16 plates—

1 plate American Blush.
1 plate Winter Bananna.
1 plate Stark.
2 plates Rome Beauty.
1 plate Gold Smith Seed Corn.
4 plates York Imperial.
2 plates Baldwin.
2 plates Ben Davis.
2 plates York Stripe.

Rufus Lawver, 9 plates—

2 plates Winesap.
1 plate Wealthy.
1 plate Rome Beauty.
2 plates Stayman.
3 plates Gano.

F. B. Fidler,

1 plate Kieffer Pears.

H. G. Baugher,

3 plates Northern Spy.

A. I. Weidner, 4 plates—

2 plates Grimes Golden.
2 plates York Imperial.

Reuben Wert,

1 plate Rome Beauty.

G. P. Myers, 8 plates—

3 plates Baldwin.
5 plates not named.

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2 plates Jonathan.

C. E. Raffensperger, 6 plates—

2 plates Baldwin.
4 plates York Imperial.

Isaiah Test,

1 plate North Star Potatoes.

F. C. Trostle, 4 plates—

2 plates Paragon.
1 plate Stark.
1 plate Baldwin.

Tyson Brothers, 3 boxes—

1 box York Imperial.
2 boxes Stayman.
Commercial pack each apple wrapped.

S. L. Lupton, Winchester, Va.—

1 box Albemarle Pippin.
1 box Stayman.
Regular Commercial pack (wrapped).

Mr. Lupton very kindly invited all to sample these boxes of apples. They were of excellent flavor and were greatly enjoyed.

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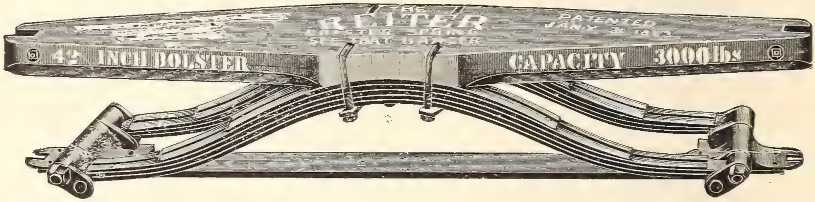
Gettysburg (G. & H. R. R.)	1905	318	333	651	4	1	......	......	....
	1906	28	......	28	......	...		......	....
	1907	127	......	127	1	...	$2 25	......	....
	1909	12	......	12	......	...	......	......	....
	1910	50	......	50		...	......	......	....
Biglerville	1903	8813	987	9800	65	...	......	......	....
	1905	7932	.....	7932	53	2	......	......	....
	1906	2785	165	2950	20	...	1 00	$ 70	....
	1907	17164	4216	21380	142	12	2 20	1 50	$ 50
	1908	4956	......	4956	33	6	1 40	75	65
	1909	10785	137	10922	73	1	2 50	1 50	55
	1910	20017	1500	21517	144	10	2 00	....	....
Guernsey	1903	2870	2413	5283	35	...	......	......	....
	1905	1771	1166	2937	20	11	....	......	....
	1906	1414	1329	2743	18	2	.....	......	..
	1907	4798	2760	7858	52	15	2 35	1 50	55
	1908	2173	......	2173	15	7	1 50	......	65
	1909	7320	......	7320	49	5	2 50	.....	55
	1910	11659	1267	12926	86	12	2 00	......	....
Bendersville	1903	4163	......	4163	28	..	......	......	....
	1905	4000	2351	6351	42	16	......	......	...
	1906	1109	1561	2670	18	20	......	......	....
	1907	2824	6268	9092	61	22	2 25	1 50	50
	1908	2264	......	2264	15	21	1 40	....	65
	1909	3531	1200	4731	32	15	2 50	1 50	50
	1910	5628	2132	7760	52	30	2 00	......	....
Gardners	1903	997	985	1982	13	...	.....	......	....
	1905	912	5215	6127	41	4	......	......	....
	1906	.. ...	......	......	......	...	.....	.....	....
	1907	6905	5440	12345	82	4	1 75	1 50	50
	1908	433	......	433	3	1	......	......	....
	1909	2275	4571	6846	46	...	.....	1 35	...
	1910	1566	3722	5288	35	1	... .	......	....
Starners	1905	682	1016	1698	11	5	. ....	......	....
	1906	664	133	797	5	4	......	......	....
	1907	1572	219	1791	12	3	......	......	....
	1908	487	.....	487	3	3	1 50	......	65
	1909	1825	8	1833	12	4	2 50	......	55
	1910	2500	2192	4692	31	3	2 00	......	....
Hunters Run (Goodyear)	1903	625	......	625	4	...	......	......	....
	1905	160	160	320	2	8	......	......	....
	1906	295	262	557	4	5	1 50	75	50
	1907	1417	514	1931	13	12	1 75	85	50
	1908	1704	.....	1704	11	1	1 50	......	....
	1909	1289	510	1799	12	1	2 50	......	...
	1910	2103	2190	4293	29	1	......	......	....
G. & H. R. R. Total	1903	17468	4385	21853	146	...	......	......	...
	1905	15617	9908	25525	170	47	.....	......	....
	1906	6295	3450	9745	65	35	......	......	....
	1907	34797	19217	54014	360	56	......	......	....
	1908	12017	......	12017	80	39	1 45	75	65
	1909	27037	6426	33463	223	26	2 50	1 50	55
	1910	43523	13003	56526	377	57	2 00		50

Gardners—1906, 2 cars pears; 1907, 1 car pears; 1908, 2 cars pears; 1910, 2 cars pears, 4 cars peaches.
Bendersville—1908, 2 cars pears; 1910, 1 car pears; 4 cars peaches.
Hunters Run—1908, 1 car pears; 1910, 1 car pears; 1 car peaches.
Biglerville—1910, 1 car cherries; 4 cars cider syrup; 43 cars canned Apples; 5 cars evaporated apples.
Guernsey—1910, 7 carspeaches.
Starners—1910, 2 cars peaches.

THE REITER

BOLSTER SPRING



See That Hanger

The best bolster Spring made. Complete and ready for use as sold. Warranted and guaranteed in every way. These springs are just what **FARMERS, GARDENERS, FRUIT GROWERS, PEDDLERS, DAIRYMEN and TEAMSTERS want,** as they will make their rough wagons ride as easy as any Spring Wagon, thus saving them the cost of Spring Wagons and enabling them to deliver their Fruits, Vegetables, Eggs, etc., unbruised and unbroken from hauling and in as good condition as when they left home.

Can Haul Any and Everything on a Rough Farm Wagon
Equal to any Spring Wagon and at One Half the Cost

With these Springs on, wagons will wear longer, harness last longer and horses work easier.

These Springs don't work on top of the Bolster, like other Bolster springs, but on each side in shackles, on the same principle as any high-priced Spring Wagon. These Springs can't be broken by overloading or rebounding like a Spring Wagon.

By overloading, the springs will work down on each side of the Bolster and the wagon will become rough again. In fast driving over rough roads the springs, not being attached to the bed or bolster, can't be broken by rebounding or lifting up of the bed.

No one using a rough wagon should be without The Reiter Bolster Spring, as they will save the cost the first year. Remember, they are warranted and guaranteed in every way. Made to carry from 1000 to 10,000 pounds. Measure your wagon between standards and order a set; give them a fair trial and let your neighbors, friends and the dealer you got them from know what you think of them.

W. C. REITER, Maker

Prices on Application WAYNESBORO, PA.

Adams County Fruit Records—(*Continued*)

Shipments Over Western Maryland R. R.

	Year	No. Bbls. shipped in Bbls.	No. Bbls. shipped in Bulk	No. Bbls. Total	No. Cars Apples (150 bbls. to car)	No. cars potatoes (500 bus. to car)	Av. price paid per Bbls.	Av. price paid per bbl. for bulk	Av. price paid per bus. potatoes
Fairfield	1905	1215	809	2024	13	3	......	......	....
	1906	300	......	300	2	2	......	..	....
	1907	300	......	300	2	2	....	......	....
	1908	......	......	......	.....	...	......	......	....
	1909	.....	......	......	......	...	.....	......	....
	1910	......	560	560	......	4	......	......	....
Virginia Mills	1907	320	8800	9120	61	...	......	......	....
	1908	......	1620	1620	11	1	......	......	....
	1909	326	1519	1845	12	...	.....	......	....
	1910	......	30	30	......	...	......	.....	....
Orrtanna	1903	3300	......	3300	22	...	......	......	....
	1905	1062	......	1062	7	...	.....	......	....
	1906	3659	......	3659	24	...	......	......	....
	1907	3177	2342	5519	37	1	$2 00	$1 50	$ 50
	1908	2686	1020	3706	25	...	.. ..	......	....
	1909	741	840	1581	10	...	2 40	1 50	....
	1910	8216	4045	12261	82	½	.....	......	....
McKnightstown	1903	3438	......	3438	23	...	.....	.....	....
	1905	7895	178	8073	54	1	......	......	....
	1906	2296	254	2550	17	⅙	1 00	1 00	47
	1907	3393	1155	4548	30	3	2 15	1 85	50
	1908	1785	251	2036	13	...	1 75	......	....
	1909	7724	2030	9754	65	⅓	2 50	1 50	....
	1910	14275	1800	16075	107¼	2	......	......	....
Seven Stars	1906	28	......	28	......	...	......	......	....
	1907	63	.....	63	.....	...	......	......	...
	1908	42	...	42	......	...	......	......	....
	1909	50	.....	50	......	...	......	......	....
	1910	26	4	30	....	...	.....	.....	....
Gettysburg (W. M. R. R.)	1906	13	......	13	......	...	......	......	....
	1907	18	......	18	......	...	......	......	....
	1908	23	......	23	....	...	......	......	....
	1909	22	......	22	....	...	.....	......	....
	1910	428	.....	428	3	..	......	......	....
New Oxford	1907	......	1033	1033	7	...	......	......	....
	1908	......	.....	.....	.....	...	......	.....	....
	1909	......	276	276	2	..	.....	......	....
	1910	......	695	695	4¾	...	......	......	....
Abbottstown	1907	382	618	1000	7	...	......	......	....
	1908	.....	.....	......	.....	...	.....	......	....
	1909	......	......	.....	...	...	......	......	....
	1910	......	.....	......	......	...	.....	......	....
East Berlin	1905	50	......	50	......	...	.....	......	....
	1906	1140	1193	2333	15	⅓	1 80	90	70
	1907	49	.....	49	......	½	2 25	2 25	60
	1908	.....	.....	......	......	...	......	......	....
	1909	10	205	215	2	...	......	......	....
	1910	1	1	2	.....	...	......	.....	....
W. M. R R. Total	1903	6738	....	6738	45	...	......	......	....
	1905	10380	1320	11700	78	5	......	.....	....
	1906	7447	1447	8894	59	3	.... .	......	....
	1907	7720	13948	21668	144	7	......	......	....
	1908	4536	2891	7427	49	1	1 75	.....	...
	1909	8873	4870	13743	91	⅓	2 50	1 50	....
	1910	22946	7135	30081	201	2½	......	......	....

Littlestown—1910 3 cars apples, 2 cars potatoes.
Dillsburg—1910 2 cars apples.
Reports show 10,000 baskets peaches grown and marketed, in addition to shipments.

SUSQUEHANNA FERTILIZERS

A WORD TO THE WISE The matter or ordering fertilizers is of vital importance Unfortunately too many farmers order just as little as they think their soil can get along with. If you are a careful dairyman you would study to make your cow eat every ounce of feed she could turn into milk. There is a limit to profitable feeding, of course, whether it is a cow or your land. The careful consideration of quantity and quality is of the utmost importance. It is the last handful of grain which means dollars of profit in the milk pail, and it is just as true that the last one hundred pounds of fertilizer means the largest returns for your investment.

If the land is suitable for the crop and you are willing to properly prepare it and carefully plant and care for the crop, then you should order as much high grade fertilizer as you can possibly use to advantage. 500 to 1,000 pounds per acre on potatoes, 400 to 800 on corn, and 300 to 500 on oats and grass ; other points being carefully provided for, will mean all the difference between slim provision for your family on the one hand, and a bountiful supply on the other. Do you not think it is worth trying ?

Don’t be a second rate farmer. We want to see all our friends in the highest class. If you have not ordered all the fertilizers you can possibly use to advantage, see our agent promptly and give him your order. It will pay you well to give this matter careful and earnest consideration, whether you buy from us or not. Don’t forget that we have spent years in perfecting a profitable crop-producing fertilizer. We use it ourselves and do not hesitate to recommend it to our friends. The highest grade is always cheapest in the end.

Agents Wanted in Unoccupied Pennsylvania Territory

EDWIN C. TYSON

General Sales Agent **FLORA DALE, PENNA.**

Adams County Fruit Records—(*Continued*)

Total Fruit Marketed in County.

	Year	No. Bbls. shipped in bbls.	No. bbls. shipped in bulk	No. bbls. Total	No. cars Apples (150 bbls. to car)	No cars potatoes 500 bus. to car	Av. Price Paid per bbl.	Av. price paid per bbl. for bulk	Av. price paid per bus. Potatoes
Total shipped.........	1903	24206	4385	28591	191	...	.....	......	...
	1905	25997	11228	37225	248	52	......	......	....
	1906	13742	4897	18639	124	38	......	......	....
	1907	42517	33165	75682	504	63	....	......	....
	1908	16553	2891	19444	129	40	$1 50	$ 75	$ 60
	1909	35910	11296	47206	314	27	2 50	1 50	50
	1910	67219	20138	87557	583	61½	2 00	1 20	50
Evaporated...........	1903	......	6547	6547	44	...	......	....	....
	1905	.....	10670	10670	71	...	......	....	....
	1907	....	8333	8333	56	...	......	75	...
	1908	......	.....	......	.....	...	...	......	....
	1909	.....	4666	4666	31	...	......	....	....
	1910	......	8600	8600	57	...	.....	......	....
Canned..............	1905	......	2400	2400	16	...	......	......	...
	1907	......	10000	10000	67	...	....	1 00	....
	1908	......	1673	1673	11	...	......	......	....
	1909	.....	12398	12398	82	...	.....	......	....
	1910	......	16700	16700	111	..	......	......	....
Cider (100,000 gals.)...	1907	......	9524	9524	63	...	......	......	....
	1908	......	6670	6670	44	...	......	......	....
	1909	.....	5714	5714	38	...	.....	......	....
	1910	......	11120	11120	74	...	......	......	....
Total Fruit...........	1903	24206	10932	35138	234	...	.....	......	....
	1905	25997	24298	50295	335	52	......	......	...
	1906	13742	4897	18639	124	38	......	......	....
	1907	42517	61622	103539	690	63	2 25	1 75	55
	1908	16553	11234	27787	185	40	1 50	75	60
	1909	35910	34074	69984	465	27	2 50	1 50	50
	1910	67219	56558	123777	825	61½	2 00	1 20	50

Comparison of Percentages

Year	Per cent. barreled	Per cent sold bulk	Per cent evaporated	Per cent canned	Per cent. cider	Per cent. total fruit compared to 1903
1903	70	12	18	......	......	100%
1905	52	22	26	......	......	143%
1907	41	32	8	10	9	295%
1909	51	16	7	18	8	200%
1910	54	16	7	14	9	356%

First National Bank

GETTYSBURG, PA.

Capital, $100,000.00 ; Surplus, $150,000.00

D. G. MINTER, President
SAM'L M. BUSHMAN, Cashier

¶ This Bank on and after NOV. 1, 1910, will pay **3½ PER CENT.** per annum on all moneys deposited for a period of six months.

¶ This rate of interest will apply to all outstanding certificates from NOVEMBER 1, 1910.

Accounts Solicited However Small

ESTABLISHED 1850 1,200 ACRES

TREES

WE ARE WHOLESALE GROWERS OF

First Class Nursery Stock

OF ALL KINDS

Fruit, Shade, Ornamental Trees, Shrubbery, Hedges, Small Fruits, etc., Asparagus, Strawberries and California Privet
IN LARGE QUANTITIES

The BEST is the CHEAPEST. Ours is the CHEAPEST because it is the BEST. Handling Dealers' orders a specialty. Catalogue free.

Franklin Davis Nursery Company

BALTIMORE, MARYLAND

Arendtsville Planing Mill and Barrel Factory

P. S. ORNER, Proprietor......ARENDTSVILLE, PA.

M'f'g of Apple Barrels and Staves a Specialty
PRICES LOW

MILLWORK of all Description, and Lumber of all kinds

Call, Phone or Write—United Phone

INDEX

A

Addresses—
  "President's", ... 23-25
  Synopsis of 1910 Minutes, ... 26-28
  "Lime Sulphur Preparation for the Summer Spraying of Orchards", ... 29-36
  "Successful Orcharding in Virginia", ... 37-45
  "Some Suggestions about the Management of Orchards", ... 46-63
  "Selecting Varieties, Preparing the Land and Planting a Commercial Orchard", ... 64-71
  "Some Comments about Important Apple Varieties" 72-83
  "General Orchard Management", ... 84-91
  "Potato Growing in Young Orchards", ... 105-112
  "Management of 700 acre Orchard for one Year", ... 92-104
  "Co-operation in Marketing Apples", ... 113-118
  "Peach Growing in Maryland", ... 119-122
  "Adaptation of Various Fruits to the Several Soil Types in the South Mountain District of Pennsylvania", ... 123-131
Apples—
  Packages, ... 147, 150
  Varieties, ... 65, 72
  Grading, ... 118
  As Fillers, ... 67
  From Unsprayed Trees (Illustration), ... 118
Amendments, ... 17
Arsenate of Lead, ... 6, 8, 20, 34, 132, 138
Anderson, Jos. W., ... 55, 57, 110
Adams, W. S., ... 36, 41, 67
Adams County Mutual Fire Insurance Co. (Adv.), ... 139
Advertisers—
  Susquehanna Fertilizer Co., (Fertilizers), ... 144
  Bateman Mfg. Co., (Cultivators and Sprayers), ... 18
  Musselman Canning Co., (Greeting), ... 14
  Goulds Mfg. Co., (Sprayers), ... 2
  Bowker Insecticide Co., (Spray Materials), ... 6
  U. S. Kleinfelter, (Barrels), ... 150
  Grasselli Chemical Co., (Spray Materials), ... 132
  B. G. Pratt Co., (Spray Materials), ... 12
  First National Bank of Gettysburg, ... 146
  Morrill and Morley, (Sprayers), ... 132
  J. G. Harrison & Sons, (Nursery Stock), ... 16
  W. C. Reiter, (Bolster Springs), ... 142
  P. S. Orner, (Barrels), ... 147
  Flinchbaugh Mfg. Co., (Engines and Sprayers), ... 156

For Fire Insurance

We claim to represent the best and largest Companys in the United States, such as the

Home of New York, with -	**$20,000,000 Surplus**
Continental of New York, with -	**19,000,000 Surplus**
Phoenix of Hartford, with -	**10,000,000 Surplus**
Insurance Co. of North America, with	**9,000,000 Surplus**
London Assurance Co., with -	**12,000,000 Surplus**

and others equally as good.

¶ *Why* not insure your properties with us, in *old and reliable* Companys, and Companys that have stood the test of *years.*

DOUGHERTY & HARTLEY

Niagara Nurseries

ESTABLISHED 1839

E. MOODY & SONS

LOCKPORT, N. Y.

* * *

Standard Pear Trees in Large Supply

A General Line of Nursery Stock

  F. S. Royster Guano Co., (Fertilizers), 140
  Franklin-Davis Nursery Co., (Nursery Stock), 146
  G. P. Read, (Packages and Cushions), 4
  Adams County Mutual Fire Insurance Co., (Insurance), 139
  Niagara Nurseries, (Nursery Stock), 148
  Dougherty & Hartley, (Insurance), 148
  Edwin C. Tyson, (Horticultural Requisites), 136
  Vreeland Chemical Co., (Spray Materials), 8
  Manhattan Oil Co., (Spray Materials), 10
  Horticultural Chemical Co., (Spray Materials), 20
  Hemingways London Purple Co., (Spray Materials), 138
Adams County Fruit Records—
  Gettysburg & Harrisburg R. R. Shipments, 141
  Western Maryland R. R. Shipments, 143
  Total Fruit, 145

B

Bateman Mfg. Co., (Adv.), 18
Bolster Springs, 142
Bowker Insecticide Co., (Adv.), 6
By-laws, 17-19
Busey, Rev. B. P. S., 23
Barrels—
  Cushions, Caps and Circles for, 4
Bordeaux Mixture, 33
  Russeting, Caused by 33, 34
Bridge Grafting, 91
Black, W. H, 36, 57, 97

C

Committees, List of, 17
Committees, Duties of, 17, 19
Cultivating Machinery, 18, 97
Constitution, 15
Cohill, E. P., 101
Cultural Methods, 26, 89, 97, 101, 103, 121
Cohill, J. A., 40, 42, 57, 59, 64, 92, 103, 110
Crimson Clover, 28
Cold Storage, need of, 24
Co-operation, Advantage of, 62, 113
Compressed Air Sprayers, 42
Crops for Orchards, 46
Cover Crops, 40, 53, 86, 98
Concentrated Lime Sulphur Solution, 104
Commercial Lime-Sulphur, 6, 8, 20, 30, 44
Climate, Influence of, 75

D

Dues, 15
Duties of Officers, 15
Diluting Concentrated Lime-Sulphur Solution, 104
Davis, Franklin & Co., (Adv.), 146

E

Executive Committee—
  List of, 3
  Duties of, 19
Eldon, R. M., 23, 67, 78, 91, 97

U. S. KLINEFELTER

MANUFACTURER OF

Standard Apple Barrels

Of Excellent Quality

DEALER IN

Fruit Baskets Of various kinds

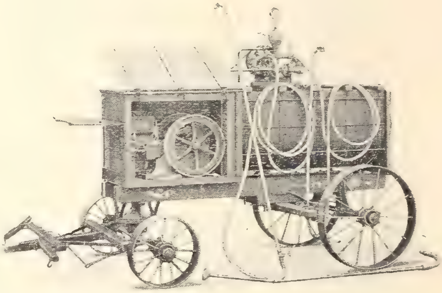
BIGLERVILLE, PENNA.

UNITED PHONE

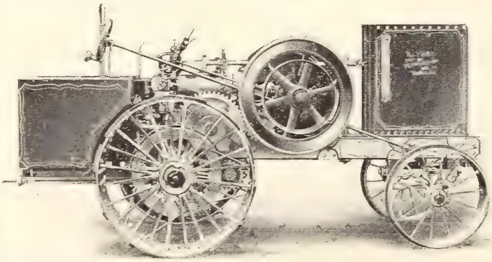
A Complete Line of

Gas and Gasoline ENGINES

made in Stationarys, Portables and Tractions. Stationarys 1½ to 50 H. P., adapted for the Farm and general purposes, doing all the hard jobs on the farm.



FARM TRACTION ENGINES



From 2 to 40 H. P., for plowing orchards and general farm work, both under belt and road. Complete **Spray Outfits,** superior to all other lines. Investigate before you buy; it may be to your interest. Sold by **ISAAC HARBOLT,** Wellsville, Pa.

Manufactured by

Flinchbaugh Mfg. Co.

YORK, PA.

F

Farm Implements, 18
Fruit Growing Profitable, 88, 90
Fidler, W. B., 110
Fruit Districts, 17
Frazer, Samuel, 57-68, 84-91, 104-112
Grape Vines, 139
Formula for Bordeaux Mixture, 32
Fruit Exhibit, 135
  Adams County Records, 141, 143, 145
Fertilizers, 95, 121, 136, 140, 144
  For Potatoes, 109
Fungicides, 6, 8, 12, 20, 30, 34

G

Griest, C. S., 39
Goulds Mfg. Co., (Adv.), 2
Grasselli Chemical Co., (Adv.), 131
Good Roads, Importance of, 98
Gould, H. P., 46-63, 72-83
Gasoline Engine Sprayers, 150, 156
Garretson, E. P., 39, 42, 43, 59, 69
Grading, 100, 118
  Board for (Illustration), 83
Grimes Golden, Origin of, 133
Gettysburg & Harrisburg R. R. (Fruit Shipments Over), 141
Garretson, Robert, 57
Griest, C. A. 98

H

Horticultural Chemical Co., (Adv.), 20
Harrison, J. G. & Sons., (Adv.), 16
Horses *vs.* Mules, 96
Hydrometers, 104
Horticultural Requisites, 136
Hemingways London Purple Co., (Adv.), 138
Illustrations—
  Grading Board, 83
  Packing Table, 84
  Diagonal Pack, 63
  Side View of Boxes, 25
  Apples from Unsprayed Trees, 118
  Apples Sprayed Once with Arsenate of Lead, 119
  York Imperial Apple, Plate, 21
  Packing Adams County Apples, 29
  Picking Adams County York Imperial, 37
  Williams Early Red Tree, 45
  Shallow soil not suitable for Trees, 49
  Deep soil suitable for Trees, 50
  Well pruned Tree, 55
  Unpruned Tree, 56
  Wounds Resulting from wrong pruning, 58-59
  Extent of Tree Roots, 60, 61-64
  Yellow Transparent Tree, 72
  Plate of Adams County Apples, 91
  Cluster of Adams County Winter Banana, 92
  Hydrometer, 104
  Basket of Adams County York Imperials, 105
  Dish of Adams County Strawberries, 113
  Cluster of Adams County York Imperial, 123
Insurance, 139, 148

F P F P F P F P F P F P F
F F F F F F F F F F F F F
P F P F P F P F P F P F P
F F F F F F F F F F F
F P F P P P F P F P F
F F F F F F F F F F F
P F P F P F P F P F P F P
F F F F F F F F F F F F F
F P F P F P F P F P F P F
F F F F F F F F F F F F F
P F P F P F P F P F P F P

Fig. 1

P P P P P P P
F F F F F F F F
F F F F F F F
P P P P P P P P
F F F F F F
F F F F F F
P P P P P P P
F F F F F F
F F F F F F
P P P P P P P P
F F F F F F F
F F F F F F F F
P P P P P P P
F F F F F F F F
F F F F F F F
P P P P P P P P
F F F F F F F
F F F F F F F F
P P P P P P P

Fig. 2

Two Methods of Hexagonal Planting With Fillers

"P" represents Permanent Trees, and "F" shows location of fillers. Fillers are omitted in center of each illustration to show more clearly appearance of orchard after fillers are removed. It will be noticed in Fif. 2 that each filler occupies the exact center of an equilateral triangle formed by the permanent trees. Fig. 1 is probably best where small growing sorts are planted as fillers among larger growing varieties. Fig. 2 is better when planting only one variety, which must be thinned when approaching maturity.

K

Kleinfelter, U. S., (Adv.), ... 150
Knous, David, ... 40

L

Lafean Apple Package and Grade Bill, ... 26, 27
Ladders Best for Orchard, ... 28, 136
Lime Sulphur as a Spray for Fruit Diseases, ... 29, 30
  For Brown Rot of Peach, ... 35
  Scott's Self-Boiled, ... 35
  For San Jose Scale, ... 43
  Commercial and Home-made Compared, ... 30-31
  Method of Making, ... 30-35
  Strength to Use Commercial, ... 34-104
Lupton, S. L., ... 37, 103, 113, 118
"Lime Sulphur Preparations for Summer Spraying of Orchards" 29

M

Membership—
  Roll of, ... 3, 5, 7, 9, 11, 13
  Constitutional Requirement for, ... 15
Minutes of 1910, Synopsis of, ... 26
Morrill & Morley, (Adv.), ... 132
Marketing, ... 24, 62
Musselman Canning Co., (Adv.), ... 14
Myers, L. M., ... 58
Manhattan Oil Co., (Adv.), ... 10
Michener, Mrs., ... 67

N

Nursery Stock, Rules for Ordering, ... 38
Newcomer, Aaron, ... 36, 56, 66, 67, 82, 100, 110
Nozzles, ... 42
Nurseries, ... 16, 146, 148

O

Officers—
  List of, ... 3
  Consist of, ... 15
  Duties of, ... 17-19
Object of Association, ... 15
Order of Business, ... 19
"Orchard Management", ... 46, 84, 92
Orchard, Potatoes in, ... 105
  Selecting Site for, ... 38, 49, 50, 69, 114, 119
  Crops in, ... 40
  Value of small, ... 48
  Laying off of, ... 69, 70
  Expenses, of growing, ... 101-103
Orner, P. S., (Adv.), ... 148

P

Potato Machinery, ... 18
Pratt Co., B. G., (Adv.), ... 12
President's Address, ... 23
Pruning Tools, ... 93, 112, 136
Pruning Apple Trees, ... 39, 40, 54, 93
  Peach Trees, ... 57, 86, 121
  Importance of proper, ... 58, 95

```
P       P       P       P       P       P       P
    F       F       F       F       F       F
P       P       P       P       P       P       P
    F       F       F       F       F       F
P       P       P       P       P       P       P
    F       F       F       F       F       F
P       P       P       P       P       P       P
    F       F       F       F       F       F
P       P       P       P       P       P       P
    F       F       F       F       F       F
P       P       P       P       P       P       P
```

Fig. 3

```
O   O   O   O   O   O   O   O   O   O   O   O   O
O   O   O   O   O   O   O   O   O   O   O   O   O
O   O   O   O   O   O   O   O   O   O   O   O   O
O   O   O   O   O   O   O   O   O   O   O   O   O
O   O   O   O   O   O   O   O   O   O   O   O   O
O   O   O   O   O   O   O   O   O   O   O   O   O
```

Fig. 4

```
P   P   P   P   P   P
F   F   F   F   F   F
P   P   P   P   P   P
F   F   F   F   F   F
P   P   P   P   P   P
F   F   F   F   F   F
```

Fig. 5

```
P   F   P   F   P   F
F   P   F   P   F   P
P   F   P   F   P   F
F   P   F   P   F   P
P   F   P   F   P   F
F   P   F   P   F   P
```

Fig. 6

Fig. 3 Quincunx system of planting—"**P**" Permanent Trees, ''F'' Fillers. Fig. 4 Square Planting. Fig. 5 Square Planting improperly thinned. Fig. 6 Proper thinning of Square Planting.

Piece Root *vs.* Whole Root, 39
Potato Growing in Orchards, 105
Peach, Marketing of, 28, 102
    As Fillers, 99
    "Growing in Maryland", 119
    Varieties of, 120
Prickett, J. W., 26, 42, 58
Planting, Method of, 70, 85, 90

R

Root Systems, Extent of, 59, 60, 61
Roberts, Arthur, 97
Read, G. P., (Adv.), 4

S

"Successful Orcharding in Virginia", 37
Spray Apparatus, 2, 18, 41, 42, 89, 132, 136
Spray Materials, 6, 8, 10, 12, 20, 33, 88, 97, 132, 136
Soil Types, 73, 119-123
Soil Adaptation, 125
Stewart, Prof. J. P., 104-154
Snyder, E. B., 91, 98, 110
Sod Mulch, 52
Surface, Prof. H. A., 97, 98
Scott, W. M., (Address), 29
Stover, Dr. J. G., 42, 110
Small Fruits, 27
Spraying, 88, 95, 122
Spraying in Summer, 96
Strainer, 154

T

Tillage, Advantage of, 51
Trees—
    Selecting, 69, 120, 146
    Heading of, 40
    Budding *vs.* Grafting, 39
    Age of, 38
Trimming Peach Trees, 121

U—V

Varieties, Number of Apple, 76
    Apples, 65, 72, 77, 103
    Peaches, 120
Vreeland Chemical Co., (Adv.), 8

W

Wages, 93, 118
Wilder, H. J., 123
Worming Trees, 100
Western Maryland Railroad, Shipments Over, 143

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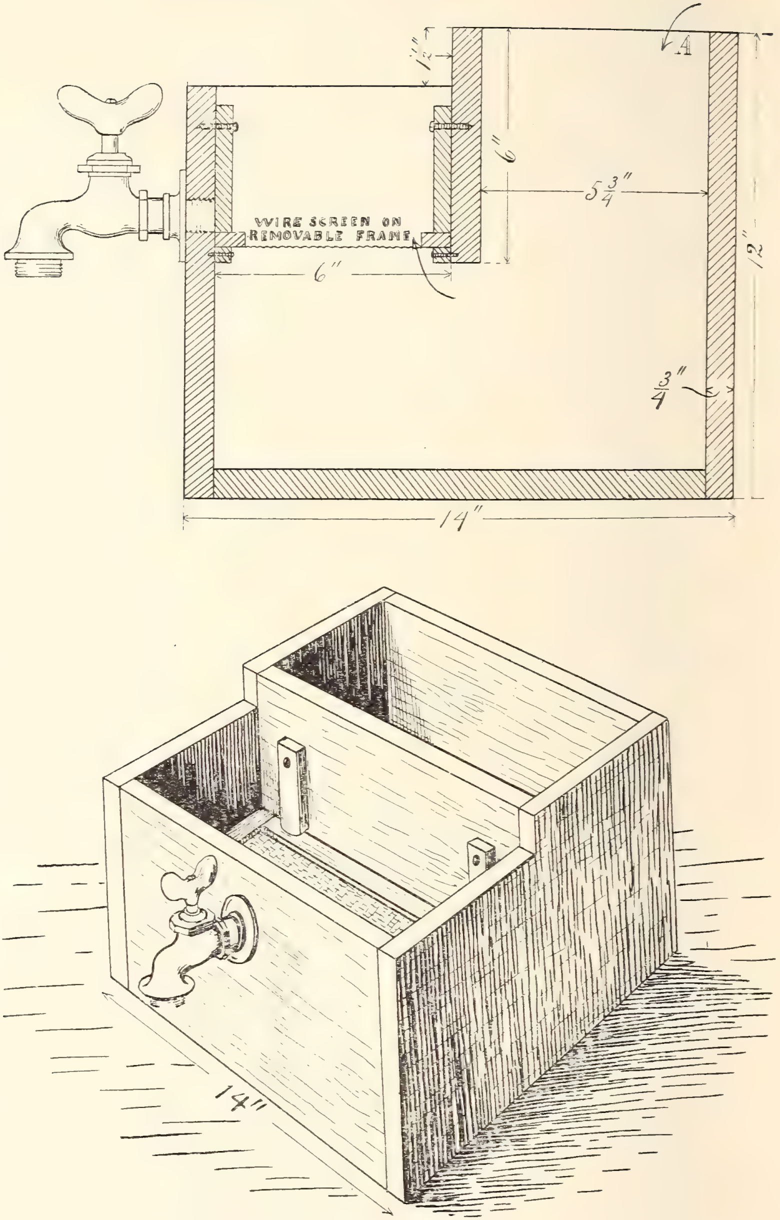

Figure 1. (Original). A new type of strainer for lime-sulphur or other spray materials (designed by Prof. J. P. Stewart, Experimental Horticulture, State College, Pa.). The liquid enters at "A" passes upward through the screen and is carried where desired through a hose attached to the spigot. The coarse particles thus fall away from the screen instead of accumulating on it. Any solution remaining with the sediment may be secured by running through it the water used in the next boiling.

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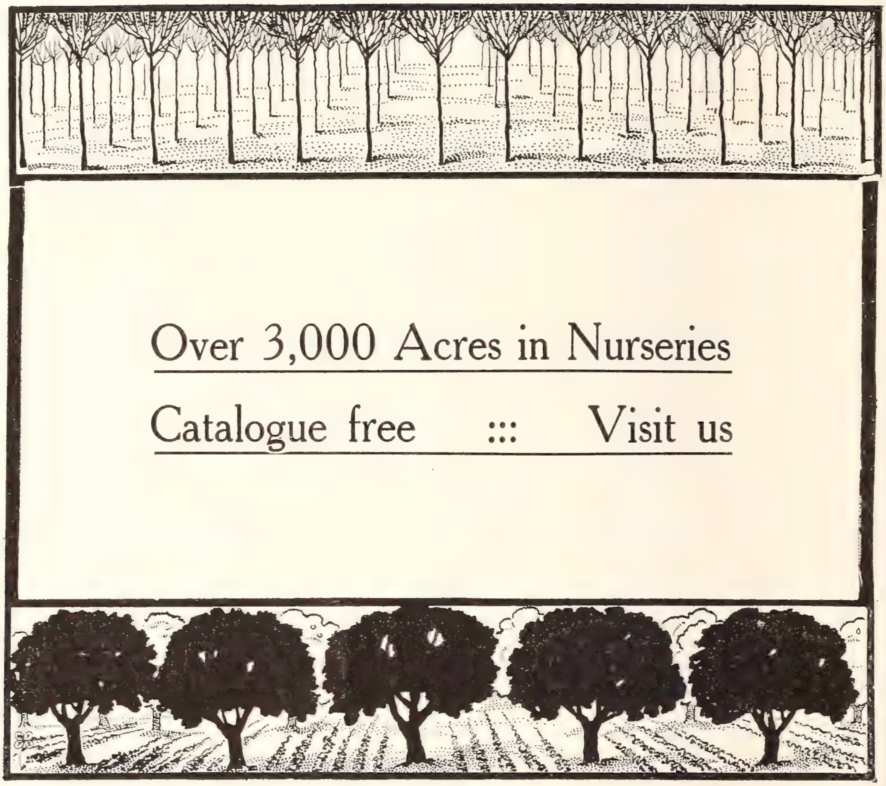

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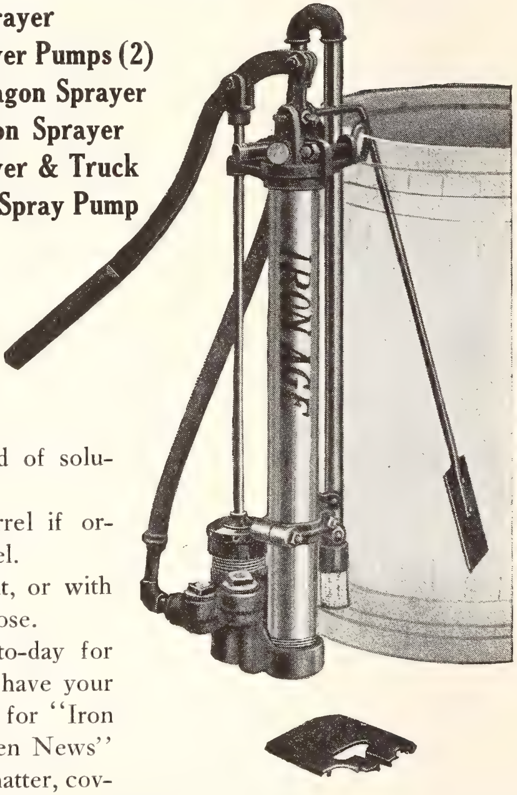

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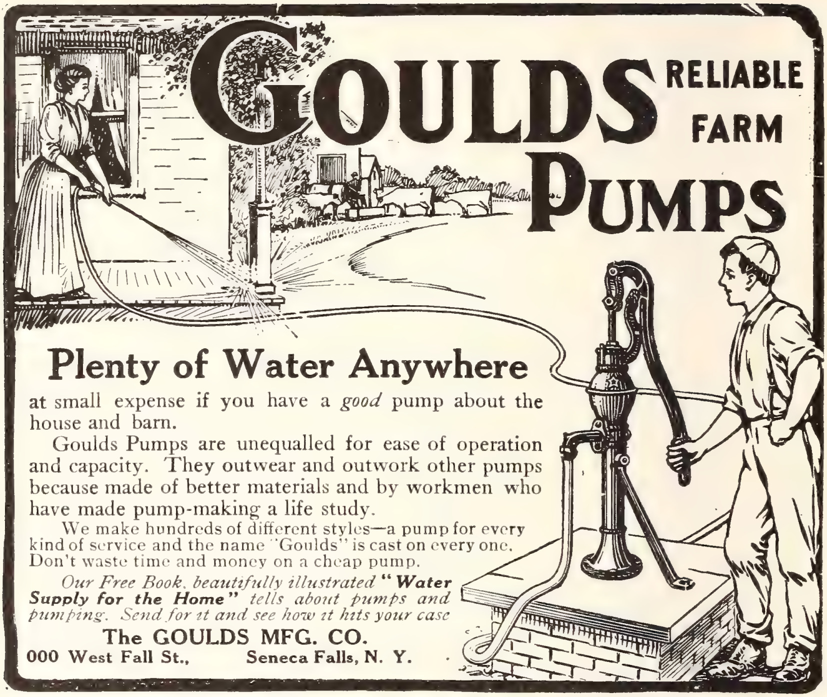


GOULDS RELIABLE FARM PUMPS

Plenty of Water Anywhere

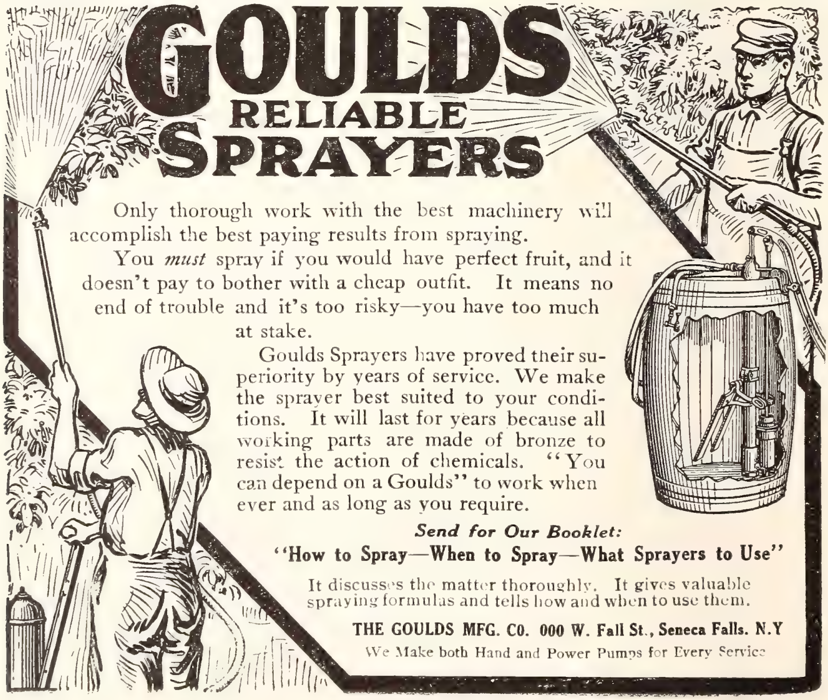
at small expense if you have a *good* pump about the house and barn.

Goulds Pumps are unequalled for ease of operation and capacity. They outwear and outwork other pumps because made of better materials and by workmen who have made pump-making a life study.

We make hundreds of different styles—a pump for every kind of service and the name "Goulds" is cast on every one. Don't waste time and money on a cheap pump.

Our Free Book, beautifully illustrated ***"Water Supply for the Home"*** *tells about pumps and pumping. Send for it and see how it hits your case*

The GOULDS MFG. CO.
000 West Fall St., Seneca Falls, N. Y.



GOULDS RELIABLE SPRAYERS

Only thorough work with the best machinery will accomplish the best paying results from spraying.

You *must* spray if you would have perfect fruit, and it doesn't pay to bother with a cheap outfit. It means no end of trouble and it's too risky—you have too much at stake.

Goulds Sprayers have proved their superiority by years of service. We make the sprayer best suited to your conditions. It will last for years because all working parts are made of bronze to resist the action of chemicals. "You can depend on a Goulds" to work when ever and as long as you require.

Send for Our Booklet:

"How to Spray—When to Spray—What Sprayers to Use"

It discusses the matter thoroughly. It gives valuable spraying formulas and tells how and when to use them.

THE GOULDS MFG. CO. 000 W. Fall St., Seneca Falls. N.Y

We Make both Hand and Power Pumps for Every Service

CONSTITUTION

PREAMBLE.

Being interested in fruit growing and believing that, by organization, we may materially advance our common interests, we hereby adopt the following Constitution and By-Laws:

ARTICLE I.—*Name.*

This Association shall be known as The Fruit Growers' Association of Adams County.

ARTICLE II.—*Object.*

The object of this Association shall be to encourage the co-operation of the fruit growers of Adams County for the protection and advancement of their common interests.

1st. By securing and disseminating such scientific and practical information as shall promote the general advancement of the fruit growing interests in this county, and shall tend to the improvement of the quality and quantity of our products.

2d. By securing such legislation as may be advantageous, and preventing that which may be detrimental.

3d. By securing such improved facilities in transportation as shall tend to give us more expeditious and economical distribution.

4th. By endeavoring to secure a better and more uniform system of packing and package.

5th. By devising some system of marketing our products which will open up and develop the markets and give to the grower a fair and remunerative return.

6th. And by endeavoring to obtain such improved systems of crop reporting as shall furnish, through co-operation with other similar Associations, accurate information concerning production; thereby enabling the fruit grower to know the exact situation.

ARTICLE III.—*Membership.*

1st. Candidates for membership may be elected by a majority vote of the members present, and upon the payment of $1.00 into the treasury shall be entitled to membership until the next Annual Meeting.

2d. Any member may renew his membership by the payment of annual dues, but upon failure to pay dues within three months after Annual Meeting, shall require re-election.

3d. No member shall receive the benefit of commissions or of co-operative buying by the Association, to an amount greater than $1.00 for the term of one year after election to membership.

ARTICLE IV.—*Dues.*

The annual dues of this Association shall be One Dollar ($1.00) payable to the treasurer at the meeting immediately preceding the annual meeting, for which the treasurer shall issue a receipt, this receipt to constitute a certificate of membership for the succeeding year.

ARTICLE V.—*Officers.*

Its officers shall consist of a President, a First, Second, Third, Fourth and Fifth Vice President, a Recording Secretary, a Corresponding Secretary, and a Treasurer, all of whom shall be elected by ballot at each Annual Meeting, to serve for the term of one year or until their successors shall be chosen. These nine (9) elective officers shall constitute an Executive Committee.

We thank our many kind friends

for their patronage through the season of 1911

And wish all Apple Growers

A Happy New Year

and a

Large Crop of Apples

for 1912

MUSSELMAN
CANNING
COMPANY

Biglerville, Pennsylvania

ARTICLE VI.—*Quorum.*

Five (5) members shall constitute a quorum for the transaction of business.

ARTICLE VII.—*Amendments.*

The Constitution and By-Laws of this Association may be amended at any regular meeting by a two-thirds vote of the members present, a notice of the proposed amendment having been presented in writing at a previous regular meeting.

ARTICLE VIII.—*Fruit Districts.*

For the purpose of distributing the work of the Association and extending its scope, the County of Adams shall be divided into the following seven (7) districts: District One, or North District, to consist of Menallen Township; District Two, or West District, to consist of Franklin Township; District Three, or Southwestern District, to consist of Highland, Liberty and Hamiltonban Townships; District Four, or South District, to consist of Cumberland, Freedom and Mt. Joy Townships, and that portion of Straban Township lying south of the Western Maryland Railroad; District Five, or Eastern District, to consist of Germany, Union, Conowaga, Mt. Pleasant, Oxford, Reading, Berwick and Hamilton Townships; District Six, or Northeastern District, to consist of Latimore, Huntingdon and Tyrone Townships; District Seven, or Central District, to consist of Butler Township and that portion of Straban Township lying north of the Western Maryland Railroad.

ARTICLE IX.—*Committees.*

The following five (5) committees shall be appointed annually by the newly-elected Executive Committee and announced at the January meeting, as follows: A committee on programs, a committee on membership, a committee on statistics, a committee on exhibits and a committee on crop reports; each committee shall be composed of one or two members from each of the seven (7) districts of Adams County, as designated in Art. 8, and one or two from each of the Counties of York, Cumberland and Franklin.

BY-LAWS

ARTICLE I.—*Duties of President.*

The President shall preside at all meetings of the Association and have a general supervision of its affairs.

ARTICLE II.—*Duties of Vice Presidents.*

The highest designated Vice President present at any meeting shall preside in the absence of the President; all of the five vice presidents shall serve on the Executive Committee in conjunction with the other elective officers; and, in addition, each vice president shall have special duties as follows:

The First Vice President shall be chairman of the program committee, and be responsible for the preparation of a program for each regular meeting, same to be announced at the preceding meeting.

The Second Vice President shall be chairman of the membership committee, and shall use every effort, personally and through members of his committee, to extend the membership and secure renewals.

The Third Vice President shall be chairman of the committee on statistics, and shall be responsible for the preparation of statistics showing number of orchards in Adams County, and, as far as possible, in York, Cumberland and Franklin Counties, with quantity, age, kind and variety of trees planted therein, for the use of the Association, adding thereto as new orchards are planted or old ones extended.

Cut Down the Number of Sprays
YET GET BETTER PROTECTION

The real cost of spraying is in the labor, not the material. Cut down the number of sprays, yet be certain those you make are most effective by using

ELECTRO ARSENATE OF LEAD

(The Powdered Form)

as your insecticide. It sticks longest because of its amorphous (non-granular) form and its exceptional fineness. Is 100 per cent. stronger than other brands because it contains 32½-33 per cent. arsenic oxide properly combined with the lead ; yet is safest as there is less than ½ of 1 per cent. water-soluble arsenic present.

Packed in from 1 lb. cartons up to 300 lb. bbls.

ELECTRO LIME-SULPHUR SOLUTION

a sure death to San Jose Scale and all scale and sucking insects. We guarantee it to test 33 degrees Baume and to contain the maximum percentage of soluble sulphur—the active insecticide. It is a cherry colored liquid free from sediment. This is the coming summer fungicide.

Packed in 50 gal. bbls., 30 and 25 gal. ½ bbls., 5 and 1 gal. cans

ELECTRO BORDO-LEAD MIXTURE

(In Paste Form)

This is a mixture of our 20 per cent. Arsenate of Lead Paste and Electro Bordo Pulp properly proportioned—a combined insecticide and fungicide especially adapted for spraying grapes, ground crops, etc.

TROUTMAN ORCHARD HEATERS

We are the eastern and foreign distributors for this positive means of insuring orchards and ground crops against frost. They give the same heat hourly and burn 50 per cent. longer, with equal amount of fuel, than any other device.

SPRAY HOSE

which stands wear and high pressure, yet cost no more than ordinary hose. A cotton-covered rubber hose of exceptional durability furnished in any length with or without couplings.

ELECTRO BRANDS

Kerosene Emulsion ; Insecticide Soap, contact insecticides for summer spraying. **Pine Tar Creosote** for treating wounds in trees. **Tree Leim** for banding trees. **Bordo-Pulp,** a concentrated Bordeaux.

Every grower ought to have a copy of our new booklet,

"SPRAYING SIMPLIFIED"

the most concise and comprehensive booklet on spraying ever issued.

THE VREELAND CHEMICAL CO., 34 Dey St., New York

The Fourth Vice President shall be chairman of the committee on exhibits, and have entire charge of securing fruit for exhibits and displaying same as directed by the Association.

The Fifth Vice President shall be chairman of the committee on crop reports, and have entire charge of collecting and compiling same for use of the Association.

ARTICLE III.—*Duties of Recording Secretary.*

The Recording Secretary shall write the minutes of the meetings of the Association and have charge of its Records and Reports.

ARTICLE IV.—*Duties of Corresponding Secretary.*

The Corresponding Secretary shall conduct the correspondence of the Association and shall receive for so doing his necessary expenses for stationery, postage, etc. He shall also act as Recording Secretary in the absence of that officer.

ARTICLE V.—*Duties of Treasurer.*

The Treasurer shall receive and keep an accurate account of all moneys belonging to the Association, paying out same on an order of the Association, signed by the President. He shall make a report of all receipts and disbursements at the annual meeting or at any time at the request of the Association. He shall mail a notice of dues to all members one week prior to the November meeting, at which time all dues are payable, and shall issue certificates of membership in exchange for all dues received. He shall also keep a roll of members who have complied with Article IV of the Constitution and embody same in his annual report.

ARTICLE VI.—*Duties of the Executive Committee.*

The Executive Committee shall have general supervision of the affairs of the Association, auditing all bills and accounts and carrying out the purposes of the Association.

ARTICLE VII.—*Meetings.*

There shall be a regular meeting of the Association on the second Saturday of each month at 7:30 P. M., unless otherwise ordered. The meeting held in December to be regarded as the Annual Meeting. Special meetings may be convened by the Executive Committee at such time as they may appoint.

ARTICLE VIII.—*Initiation of Officers.*

All new officers shall assume the duties of office at the opening of the meeting immediately following the one at which they were elected, except that the newly-elected Executive Committee shall prepare and announce, at the January meeting, the membership roll of the five (5) committees specified in Art. 9, and the chairman of program committee shall prepare a program for the February meeting and announce same at the January meeting.

ARTICLE IX.—*Order of Business.*

1st. Reading of minutes of previous meeting.
2d. Nominations and elections.
3d. Reports of committees.
4th. Deferred business.
5th. Communications.
6th. New business.
7th. Discussion of questions.

HIGHEST QUALITY

SEED

POTATOES

My Seed Potatoes are grown specially for me, under contract, in Arostook County, Maine. (Every potato grower knows that Arostook County, Maine, produces the finest seed Potatoes in the world.)

Those who have grown New York State, or Michigan or home grown seed and then this fancy **Maine Grown Seed,** have nothing further for any except **Maine Seed.** There are many potatoes sold as Maine Seed that never saw Maine---beware of them.

YOU GET GENUINE MAINE SEED FROM ME

Place Your Order Now for March or April Delivery

FIVE CARLOADS COMING

MOST OF THEM ALREADY SOLD

Irish Cobbler, Early Ohio, Bovee, Beauty of Hebron, Early Rose, Green Mountain, Gold Coin, Sir Walter Raleigh, Rural New Yorker, Carman No. 3, Quick Crop, Early Harvest, Rose of Erin, Early Perfection, American Giant, Early Eureka, Noraton Beauty, Quick Lunch.

Any of the above $4.50 per sack (2¾ Bushels)

WALTER S. SCHELL

Quality Seeds

1307-1309 Market St. ::: HARRISBURG, PA.

Bliss Triumph (Early Round Red), @ $5.00. F. O. B. H'b'g

PROCEEDINGS

OF THE

SEVENTH ANNUAL CONVENTION

OF THE

FRUIT GROWERS' ASSOCIATION

OF

ADAMS COUNTY, PA.

The Seventh Annual Convention was called to order by the President, Robert M. Eldon, at 2:00 p. m., Wednesday, December 13, 1911, in Fruit Growers' Hall, Bendersville, Pa.

The convention was opened with prayer by the Rev. D. T. Koser.

PRESIDENT'S ADDRESS.

ROBT. M. ELDON.

We are glad to welcome members of the Fruit Growers' Association, visitors, lecturers and patrons to the seventh convention. We are in practically new quarters. By the offer of increased rentals, the fruit growers organization so encouraged the owners of the old hall that they were moved to add much thereto, which I am sure you will appreciate during the days of this week. The growth of the organization from less than forty at the first meeting in 1903 to more than two hundred sixty in 1911 is most gratifying. Sometimes there is a failure to renew for a year, but mostly the man or woman once a member, comes promptly forward with a renewal. Not all of our membership own orchards or fruit trees but join because since the coming of the fruit growers' association they find that they can get better and cheaper fruit, or because as business men, professional men or laborers, they know that the fruit-growing industry has greatly increased the amount of money returned to the county, a part, and a very large part of the gross returns is certain to come to them in the usual course.

A number have joined, if for no other reason, because they say that to sit and see and hear at convention time is worth the price. I can see several of these now, and there are others also filled with the good American desire to help a good thing along. Join the Fruit Growers' Association and become part owner of a large amount of good-fellowship. You will later get a copy of the Proceedings which will be of value to you. A text book on Horticulture. Not theory, but the boiled down experience of practical men. A real text book on the subject of Horticulture, well worth the money.

More than the usual care has been exercised during the past year in spraying for the scale insects and for the codling moth and its co-laborer the curculio. It is impossible to expect that any of the trio named or of many other pests attacking tree, foliage or fruit will ever become exterminated, but we believe that all may be held in check by careful and timely work.

Several of our members have noticed the same fault in spraying operation, namely, that the nozzle man kept too close to the tree so that some of the branch tips at about the level of the operator's face were entirely missed. I have called the attention of my helpers to this at least a score of times during the past season, and we found at picking time that the few scale present were on the fruit from these branches. By the use of bends for the rods or angle nozzles, the old fault of poorly sprayed lower branches has been cured.

To do a good spraying job, high pressure and large air-chamber space are of the first importance. A good pump and a willing pump-man are good but the compressed-air sprayer is the coming sprayer. Either a central plant where an engine and compressor can charge the power tank of the sprayer while the spray liquid tank is being filled, or the portable engine and compressor outfit fills the bill as no direct pumping outfit can possible fill it. The first of these two types is the lighter while the second is perhaps the safer and more efficient. This second type can reach full spraying pressure while the operator is straightening out the hose and rod, and it has a constantly increasing air-chamber space at maximum pressure.

The occurrence of Cedar Rust has been much less prevalent during 1911 than during 1910, but there is apparently no way of determining whether this is due to climatic conditions or to the general cutting away of the cedar trees. If the scientists are correct in their statement that the cedar trees and the apple trees are alternate hosts for the fungus, it would be sound argument to say that the cutting of the cedar trees is the chief factor in the lessened amount of the fungus injury.

Many trees in the neighborhood suffered severely from fire blight, which is certainly the most distressing of the apple orchardist's troubles, requiring a cure that is no cure, but a partial or entire destruction of the tree.

The apples seem to have had a poor blooming season yet set a heavy crop as did also cherries. Peaches bloomed freely but fell off, probably due to overbearing in 1910 and lack of other care. Small fruits were generally disappointing.

The apple crop was the largest in the history of the county, but at the present time figures are not available. Its quality was good. Perhaps a part larger than usual went to the cannery and evaporator, on account of the general large crop throughout the country.

While we desire first of all to grow apples for the box trade and the high class barrel trade, there will always be a quantity larger or smaller moving toward the cannery and dryhouse, and surely in the future when the Adams county full crop year coincides with the outside full crop, a great mass of fruit will be directed to them. We have but one cannery and two evaporators under one management within a radius of several miles. There should be others so that we might profit by reasonable competition. I should like to see a co-operative canning and evaporating plant owned and operated by the members of this organization. I am not alone in thinking that the price of drops and culls is too low. New York growers get much better prices. Evaporators are much more plentiful there or growers dry their own fruit.

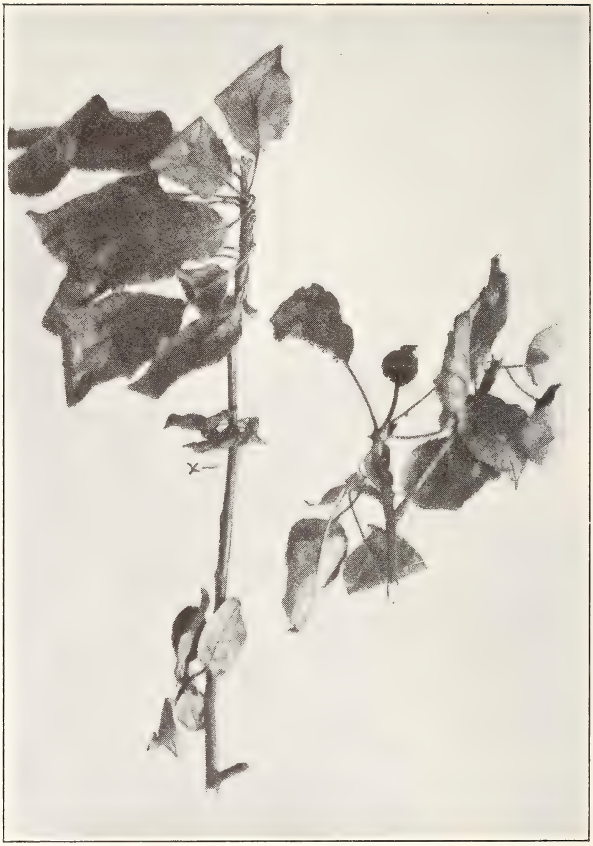
Let us make a concerted effort to have the Adams County Exhibit better than any previous Adams County Exhibit, and better than any other county exhibit. Partly because we want to keep the cup offered as a prize for best exhibits, but principally because the habit of winning is a good habit to cultivate, when the accomplishment of the object striven for, does not injure the other fellow in the race. Our sister counties have good individual growers who are certain to have good fruit on exhibition, but not having been organized so long as have the Adams county growers, they do not pull together as perhaps we do. It takes not only care in growing fine fruit but continued effort in following it through all the stages of its course from picking to judging. Ever since our organization began to compete as a county exhibitor it has always had a number of its members on hand to take advantage of the choice of space, and to see that the fruit is properly selected and displayed.

The practice of making an exhibit at our own convention is the best kind of training in preparation for the second and more elaborate display at the State meeting.

Join the State Society and attend its sessions. Help to make it the best in the country. It should have two thousand members and two hundred or more of them should come from the first fruit producing county.

Join the Adams County Association and persuade others to do the same thing. Attendance at its sessions will help you to understand your troubles which is half way to mastery over them. You cannot expect to remember all that you hear here. Join and get the record, the Proceedings.

* * *



Twig Blight of Apple.

APPLE DISEASES.

Prof. H. R. Fulton, *Pennsylvania State College.*

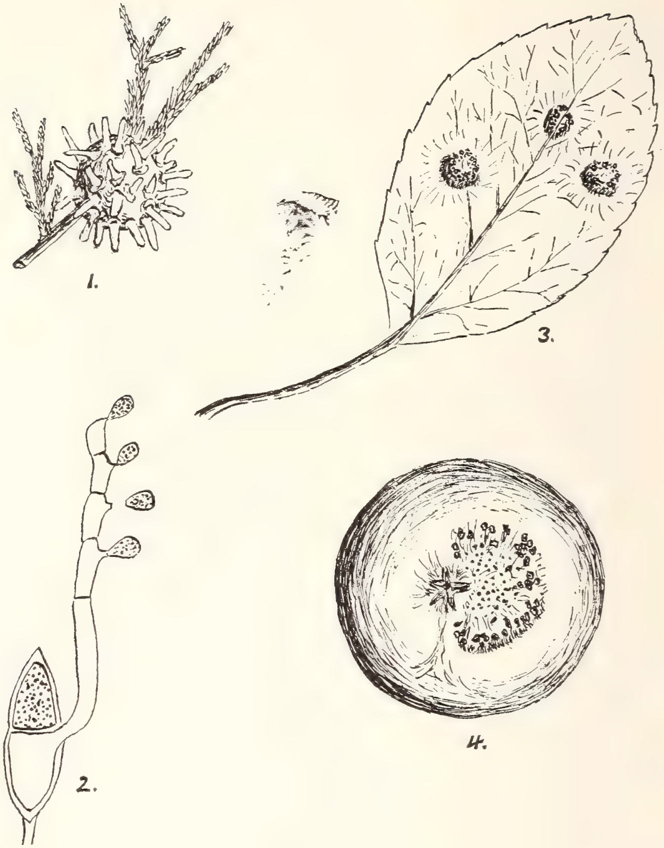
I have been asked to speak on the subject of apple diseases. Fully twenty of these, affecting all parts of the apple tree, have come to my notice in Pennsylvania. Fortunately the majority are only slightly injurious; several that are very serious in other sections of the country occur very infrequently with us. We can consider only the most important apple diseases to-day.

These diseases, for our purpose, may be classified as fungous and bacterial diseases, and physiological diseases, remembering that bacteria are, after all, merely a special kind of fungi. Those of the first class are caused by living plant organisms of very small size, that may spread from plant to plant; and these diseases are infectious or contagious in character. However, climatic and local weather conditions, as well as other conditions of environment, may favor or check epidemics of such diseases, either directly by influencing the spread and development of the organisms, or indirectly by placing the host plant in a condition of greater or less susceptibility. But always the causative organism must be present, and control measures must usually be aimed directly at it.

Occasionally, as in the case of the Powdery Mildew on leaves and young shoots of apple, the fungus may be killed after gaining foothold by applications of a fungicide. In mose cases the aim must be to prevent the first infection; because, as a rule, when the organism has become established, there is no hope of eradicating it from invaded parts.

For infection to occur, three conditions must hold: There must be a source of contagion, there must be a susceptible host plant, and the general environmental conditions must favor the infection. To prevent infection, we must take these things into account, and the special measures will vary for each disease according to its peculiarities with reference to these three conditions. For illustration think of well known treatment for apple Scab, which calls for three applications of a proper fungicide, just before the buds open, just after the petals fall, and a third two weeks later. The coating of fungicide on fruit and leaves makes an unfavorable environment for the development of the scab fungus there. This is made when the parts in question are young and in their most susceptible condition. And it so happens that the source of early contagion for Scab is the so-called winter-spores that form slowly during winter on fallen apple leaves infected the previous year with Scab, and reach maturity, are scattered, and retain their vitality for three or four weeks only, about the apple blossoming time. I know of cases where elimination of the fallen leaves, by plowing them under before the time indicated, or by burning them, has given successful control; but such measures do not commend themselves on the score of general practicability. Varietal susceptibility influences very much Scab infection, and should influence our treatment of it. Baldwin, York Imperial, Ben Davis and Jonathan are affected little or not at all, while Stayman Winesap, McIntosh, Spitzenburg, and Northern Spy are quite susceptible. Discrimination in the treatment of varieties varying in susceptibility will promote efficiency and economy not only for scab, but for other troubles. A wet, cool spring favors Scab. Our climatic conditions, fortunately, are less conducive to Scab development than those farther north; and we can for this reason safely omit, in the average season and on the average variety, the early application, just before the blossoms open.

In the case of Cedar or Orange Rust, unprotected young leaves and fruit of certain varieties are the endangered parts; the infective material in this case comes from red cedars that may harbor the fungus in the familiar "cedar-apples;" and infection is favored by periods of continuous wet weather for two or three days. When these conditions occur together, which is only occasionally, we have an outbreak of Cedar Rust. For this disease the removal of endangering red cedars from the vicinity of orchards has proved more constantly effective than spraying.



Gymnosporangium Macropus.

1. Cedar-apple with gelatinous horns. 2. A spore from a gelatinous horn germinating and producting four infection spores, one of which is detached. (Very highly magnified). 3 and 4. Apple leaf and fruit with the cluster-cup stage of the fungus.

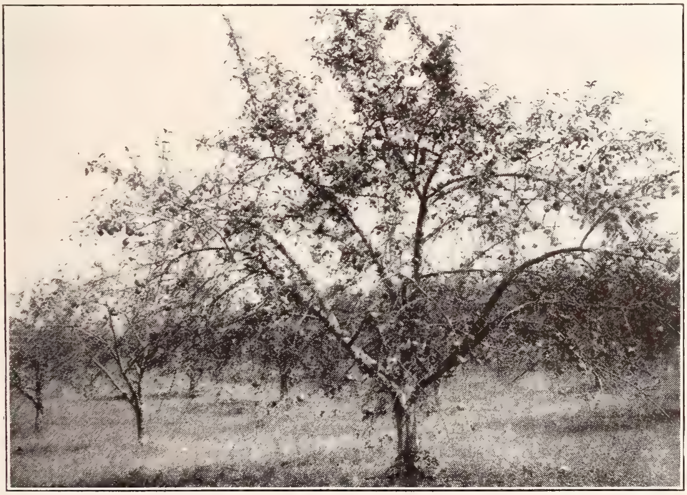
We were speaking of the spray applications, for us usually two in number, made when the petals fall and two weeks later, that are timed particularly for Scab control. These, let us remember, will also be more or less effective for Cedar or Orange Rust on leaves and fruit, for Blotch on leaves and fruit, for Sooty Mold on fruit, and for Black Rot Spot (Sphaeropsis and Frog Eye Spot (Illosporium) on leaves. The diluted lime-sulphur material seems to be satisfactorily effective against these troubles, and is preferred to Bordeaux mixture. Where Blotch and Black Rot prevail, care should be taken to cover twigs and limbs at one of the sprayings; and as thorough as possible pruning out of affected woody parts should be practiced.

Sometimes, when cool, moist weather prevails, there may be a midsummer outbreak of Scab; and usually the leaf spotting fungi and Sooty Mold and Blotch of the fruit continue to cause infection until late in the season. Furthermore, Bitter Rot and Fruit Spot usually begin their attacks after the fruit is half grown; and such ripe rots as Black Rot, Brown Rot, and Volutella Rot come on in the latter part of the year. More efficient protection is afforded against all of these if a fungicidal application is made in July, at the time when spraying is done for the second codling moth brood. Where Blotch and Bitter Rot prevail, Bordeaux mixture must be used in midsummer and the application made two or three times at intervals of two weeks on varieties susceptible to these destructive diseases.

A word further about Blotch and Bitter Rot may not be out of place. Both of these diseases are among the most serious affecting apples in the South. They occur in Pennsylvania to a small degree only, but we must be on the alert lest they gain a greater foothold.

Bitter Rot spots are brown and circular, and the rot extends inward in a cone-shaped area quite rapidly, so that it may reach the core by the time the surface area is the size of a half dollar. The surface is dotted with spore pustules which emit minute flesh-colored, waxy masses of spores rather early in the development of the rot. The fungus lives over winter in mummied apples on the trees, but not in those that rot on the ground; and in the limb cankers, when these are formed. Of our commercial varieties Jonathan is likely to suffer most.

Blotch affects the surface of the fruit, without directly causing rot. The skin is discolored, and sometimes thickened so that small raised areas are apparent. These are covered with minute black dots in which the spores are formed. When attacked early the fruit is dwarfed and deformed. The fungus attacks leaves and twigs, surviving the winter in the latter. Ben Davis is the most susceptible of our commercial apples.



Unsprayed York Imperial Tree Almost Defoliated by Leaf-Spot.

The Fruit Spot that can be controlled by July spraying is characterized by numerous small spots, about 1-16 of an inch across, that are at first deeper green or red than the surrounding color; and soon becomes dead, and brown or black. The flesh is not affected deeply. They are more numerous towards the apex of the fruit, and frequently occur at lenticels. The cause of this fruit spot is the fungus Cylindrosporium pomi, which infects the fruit during July as a rule, and can be readily prevented by one or two applications of almost any fungicide during the first half of July. We must not confuse this disease with that known as Fruit Pit which seems not to be due to fungus attack, and can not be controlled by spraying.

Let us remember that the requirement for summer spraying, as for any spraying, and the returns to be obtained from it, depend on the presence of certain fungi that develop then, the growing of varieties susceptible to their attack, and the occurrence of weather conditions that would favor their development; and that the most satisfactory results will be obtained when judicious spraying is an adjunct to the use of good methods of culture and sanitation. Spraying is, after all, an expedient to catch, as it were, the thief after he is in the house. Let us see to it that we do not allow ways to multiply by which he may enter.

There are certain transmissible diseases that can not be satisfactorily controlled by spraying, such as Twig Blight, and the cankers produced by the Black Rot and Bitter Rot fungi, and the several wood rots and root rots. Our only means of holding these in check is to discover the trouble at an early period in its development, and thoroughly remove all affected tissue.

Twig Blight, sometimes known as Fire Blight, attacks young shoots, the bark of older limbs, and sometimes the blossoms or young fruit. As soon as blighted twigs are noticed, they should be cut off well below the affected part and the cut surface, however small, touched with a swab wet with a disinfectant, such as 1 to 1000 bichloride of mercury; tools also should be wiped with such a solution at frequent intervals. Cankers can frequently be cut out; but often the affected part must be sacrificed. Large cuts should be painted over as well as disinfected.

Collar Rot as we find it causing the death of the bark at the base of the trunk of apple trees, is a perplexing condition. I am not satisfied as to its causation in every case. Perhaps we ought to bear in mind that this part of the tree is the one where general decay is most likely to occur because moisture from the soil and a good oxygen supply favor general decay organisms. We know that a fence post will usually rot because of the same conditions, more rapidly near the surface of the ground than above or below. I am sure that in some cases winter injury is primarily responsible for the trouble with the apple trees. In a few instances I have found the Blight bacterium present as the cause of the extensive death of the bark; and I have also found other organisms associated with the trouble, such as the fungus of Black Rot, the wood rotting Schizophyllum, and the root rotting Armillaria. In the far west, some hold that arsenic injury to bark is responsible for a somewhat similar, although apparently not identical condition. And there are cases where improper painting of trunks has caused trouble. But when all these things are considered, I am not satisfied in my own mind that I can satisfactorily account for half of the so-called Collar Rot that I have seen.

Though we can not yet speak certainly about its causation, we ought to take precautions against its possible spread. In hunting borers in orchards affected with collar rot, free use should be made of disinfecting solution on all wounds and tools. Close watch should be kept for the first signs of the trouble, and the affected area cut out as thoroughly as may be, leaving the live bark with a smooth edge for healing. The cut surface should be washed with bichloride of mercury or strong lime-sulphur as a disinfectant, and the surface painted with pure lead and oil paint or tar. When the exposed surface is large, and above ground, a coating of grafting wax will prevent drying out, and promote healing. Diseased trees should be prevented from carrying a full crop of fruit, and attention should be paid to securing proper soil moisture and aeration and fertilization. Judicious reduction of foliage by summer pruning would doubtless be helpful.

We come next to those constitutional disorders that we call physiological diseases. They are not caused by organisms of any sort; they result from derangements of the normal physiological functions of the plant parts, usually due to unfavorable environmental conditions. Our knowledge of them at present is meagre; and from their nature control measures are unfortunately of limited applicability. Such troubles are Fruit Pit (perhaps more usually known as Baldwin Spot, although this term is also sometimes confusingly applied to Fruit Spot mentioned above), Watery Core, Watery Apex, Sun Scald, Sticky Skin, and probably Jonathan Spot.

Fruit Pit shows rather large, vaguely outlined, slightly depressed spots, that suggest finger print bruises. Under these the flesh is dead for some distance, and later the surface becomes dead and brown. Frequently affected areas can be found in the interior of the flesh. The cause is supposed to be lack of sufficient moisture at certain periods in fruit development, especially sudden changes from wet to very dry conditions. It may be that tillage methods can be so developed as to equalize the soil water supply sufficiently to reduce this trouble to a minimum.

Watery Core and Watery Apex seem to be different forms of the same trouble. Continued deficiency of water may cause the cell sap to reach such high concentration as to kill the living substance, and there is a consequent diffusion of sap into the small spaces in the apple tissue, giving the watery, instead of the whitish, opaque appearance; or a sudden access of water after the cell sap has become highly concentrated, may result similarly.

Sun Scald is injury to the cells from intense heat. It is accompanied by abnormal ripening of tissues in the vicinity. It may be aggravated by liquid on the surface of the exposed fruit and is frequently seen on fruit suddenly exposed to the sun's rays after being shaded.

I do not know of any explanation for the condition known as Sticky Skin or Dead Skin. Microscopically the tissues in such cases seem fairly normal.

The Jonathan Spot is also hard to explain in the light of our present knowledge. It seems not to be due to any organism. Whether or not it is related to the physiological Fruit Pit is an open question. Perhaps we will find eventually that it is a trouble distinct from others enumerated. It has been suspected to be a form of arsenic injury, but tests made in 1911 by the U. S. Department of Agriculture indicate that heavy applications of arsenic do not increase the amount of spotting. It develops much more on apples in ordinary storage than on those in cold storage and attention to this point is advised when apples give indication of developing this trouble.

Apples From Unsprayed Trees. Large Pile, Culls.
Small Pile on the Right, Saleable Fruit.
(Photo. by Peairs.)

Five-Year-Old Peach Tree Showing Great Spread of Roots. Root Shown 17 Feet Long.

PEACH CULTURE.

John F. Boyer, *Middleburg, Snyder County, Pa.*

Peach culture is very different to-day from what it was 25 years ago, and in many localities the cultivation of this delicious fruit has been entirely abandoned. It is, however, a fruit so well known in Pennsylvania that a description is not necessary. Years ago a peach tree would live to bear almost like an apple tree, especially the seedling, which to-day is harder in bud than budded trees, but the tree itself seems to have lost the vitality it once had and is no more a longer lived tree than trees from the nursery. What brought about these changes?

I believe that Providence had a great deal to do with production. It seems to me that a man is limited in all lines of production. In my opinion, surely, the man who bites off more than he can chew will make a flat failure in peach culture.

It is not extensive but intensive peach culture that pays. The man who can do the proper thing at the proper time is always the man who offers the choicest fruits on our markets and that is the only fruit that pays the producer.

Common and poor fruit was never very renumerative with me. The subject of peach culture seemed to me like a funnel, looking into it at the small end, the farther you see into it, the wider the subject gets. I always feel my inability to do justice to this subject. The novice then would ask what are the requirements to be a successful peach grower. My anwer would be, the *Man,* the *Loca-*

tion, and the *Soil,* would be the chief requirements; and the most important of the three is the Man himself because he may cause failure where the most favorable conditions exist.

He must take a liking to the business. Having such a man, next in importance is the *soil.* I do not expect to find it disputed when I say God made the soil complete—by which I mean that virgin soil contains all the required elements to produce both the tree and the fruit. Where shall this soil be located? By all means on the hills, where there is an air drainage, get above the frost line, do not make the mistake of putting your orchard in a ravine where it is thought by many the cold winds cannot strike them. We have all learned and often heard the remark on a cool evening—If the wind's calm, we will have a frost. What does this mean? It means as long as the wind blows, moisture will not settle, and as long as moisture does not settle, frost cannot form; but just as soon as the motion of the air ceases then moisture will gather and freeze. In many so-called sheltered places where not sufficient air can get in, moisture will settle and cause the loss of a crop of fruit.

Having the location, next in order would be the *trees.* I never expected the nurseryman to grow these for me. All I want from the nurseryman is the starter. I never wanted the heavy first class trees, neither would I recommend a very small tree. For, should a dry season follow, heavy loss would be the result, as the tree which should be planted in early spring has no way of taking nourishment until fibers form, and in a dry season, would die or dry up, if too light before fibers form. If too heavy not enough rootlets come with the tree from the nursery, and this goes to the other extreme. Having trees to caliber one-half inch planted a little deeper than they stood in the nursery, in ground plowed deep, and prepared as for a crop of corn is about right. After the trees are set fifteen feet apart each way, then comes the work of the pruning knife, here again the medium sized tree has the preference. Any one familiar with the peach tree from the nursery knows full well that a tree has a set of branches, then buds, then another set of branches, then buds again. In heavy trees the tree has to be cut either right above the collar which is too low; or at the second set of buds which is too high; giving the tree too much leverage when planted in the full sway of the wind. Potatoes or any cultivated crop may be grown for two years, after which time the entire ground should be given to the tree, and thoroughly cultivated. The leaders should be cut back for three years, that is the time required to grow peach trees of bearing size. The peach tree is unlike the apple. The apple has fruit spurs while the peach bears its fruit on the previous year's growth of wood.

Consequently we must have a succession of new growth of wood. By thorough cultivation and proper pruning and not allowing the trees to overbear, the desired new-growth can be controlled, and fair crops can be produced; unless the winter season becomes too severe. Properly ripened peach buds will stand a temperature of 15 degrees below. A man has far more control than is generally believed by not allowing the tree to overbear. This is the whole secret of getting the buds in proper shape. Otherwise the tree has no time to mature the crop and prepare the buds for the following year. Thinning the fruit should be done after the June drop.

The peach *borer* can easily be controlled by removing the soil from around the trunk, and extract the borers with pocket-knife or some pointed iron. The peach borer does not cut wood like the apple, but feeds on the Cambium layer, and if taken before he gets down in the roots, can be easily destroyed.

Spraying for scale and fungus diseases must be carefully and thoroughly done in early spring, before the blossoms open. Lime and sulphur is the most satisfactory material, known at the present time, for both the scale and fungi.

In my 28 years' experience as a peach grower I have yet to learn what crop to grow in a bearing peach orchard that is not grown at the expense of the peach crop. Frequently I am asked what crop can be grown in a peach orchard, when bearing; and my answer is always a Peach Crop. The disease known as "Yellows," among peach trees is first noticed in the premature ripening of the fruit.

Then follows the wiry growth on branches generally in clusters, with very narrow foliage. The word "Yellows" does not indicate that a tree with yellow leaves has taken this disease, as a tree may not have proper nourishment or may be attacked by borers which cause the foliage to turn yellow; and such trees will respond very readily if proper treatment given.

And again, a tree with the most vigorous foliage, dark green, may premature it fruit and fully develope the disease. The only way I know to hold this disease in check is to remove the tree and burn on the spot.

It was frequently stated a few years ago that the peach business would fall in the hands of specialists, and I really believed it myself, but I have changed my mind. Since the San Jose scale has made it appearance in sufficient numbers to destroy those orchards planted by the negligent fellows, they are not in business. Only the stand-pat fellows are in the peach business to-day, and they are here to stay. The Syndicate or incorporated orchard companies must learn that they are carrying on their business with disinterested help, and to have thousands of acres of orchards will necessitate them spreading labor over too large an acreage and the result is slighted work going on all the time.

The fruit business is different from factory work—where one foreman can stand over hundreds of hands and control them successfully. The biggest mistake I ever made was when I increased my peach business until at one time I had between 43 and 44 thousand trees in cultivation and it was impossible for me to have the fruit picked and packed in proper shape; and I found that I had to reduce my acreage in order to have the fruit right for the consumers.

You see, someone had told me to be sure that I was right and then go ahead; well, I started to grow more peaches to get more money to buy more land to plant more trees to get more money to buy more land to grow more peaches; and that is the way I got into the business so extensively. My neighbors who had only small orchards had finer fruit than mine. You see, I wanted to be one of those specialists, but I soon discovered that the old saying that the big fish eat the little was not true. In fact, I believe the time will soon be here that the little fish will eat the big. At least, I do not fear the competition of large orchard companies, but I do fear the competition of the fellow who has only as many acres in cultivation as he can look after himself.

To summarize—would say, the right man—the right location—the right soil—with all requirements strictly carried out, from the planting of the tree to the marketing of the fruit, will find peach culture as profitable as the culture of any other fruit.

R. M. Eldon. Do you have any trouble in getting the right men to do your work?

Mr. Boyer. That is just my trouble, to get that kind of help. The labor problem is the biggest trouble I have in my business. I do not have much trouble to dispose of my fruit. It requires intelligent help and I cannot always get enough of the right kind.

C. S. Griest. In picking your fruit, how often do you go over the same trees?

Mr. Boyer. About twice. That is the time they should be sorted, too.

Member. Do you use any commercial fertilizer?

Mr. Boyer. I had a commercial fertilizer made for the peach crop, 10 per cent. available Phos.-acid and 8 per cent. Potash, and I could not see any difference. I could see a difference on the clover and other crops afterward.

Member. How much to the acre?

Mr. Boyer. One-half ton.

Member. Any difference in the color of the fruit?

Mr. Boyer. None whatever.

Member. Did it seem to increase the quantity?

Mr. Boyer. No.

Member. Did you use barnyard manure?

Mr. Boyer. No indeed.

Member. Do you take off premature fruit?

Mr. Boyer. The first symptom is the premature ripening of the fruit, and about the third summer if you do not take the tree out it would die itself.

Member. How often do you cultivate in a season?

Mr. Boyer. That depends a little on the rain-fall. If I have my man in the orchard to-day, and we should have a hard rain tomorrow, that same portion would have to be cultivated just as soon as the ground gets into proper condition. It is moisture the peach grower is after more than anything else. About 80 per cent. of the peach is moisture. In fact, taking all crops, moisture is the chief element. We know a layer of loose ground acts just the same as straw manure. We can take a harrow and loosen the ground, and that acts as a mulch.

Member. Do you use a spring-tooth harrow for cultivation?

Mr. Boyer. I do.

Member. Do you head them back each year?

Mr. Boyer. The first season I cut the leaders back. The nicest fruit grows on the top. We just prune so that we have a nice bearing tree and a nice crop. We head in the long branches so as to keep it from growing out of shape.

Member. Which variety gives you the largest quantity of extra fine fruit? Which variety brings you the most money?

Mr. Boyer. Elberta.

Member. Do you grow the Champion?

Mr. Boyer. I do.

Member. Do you grow the Carman?

Mr. Boyer. We do not grow very many.

Member. What is the difference between the Carmen and Bell of Georgia?

Mr. Boyer. The Belle of Georgia is about on the same list. The Mountain Rose is about the first free-stone. They rot very badly in a wet season. The late ones do too but not so bad as the semi-clings.

Member. What are the principal varieties that you have growing at the present time?

Mr. Boyer. I grow a good many Salway, which I would not recommend on a soil under 800 ft. above sea level. They are not good on low ground, but where you have the altitude, the Salway is a very profitable peach. Also grow, Elberta, Stump and Old Mixon. We have some new varieties but they are not tested out yet.

Member. Have you the Iron Mountain?

Mr. Boyer. I have.

Member. Is there much difference between that and Ford's Late White?

Mr. Boyer. Not much.

Member. Does the Iron Mountain have more color?

Mr. Boyer. I have the trees growing and can not tell you much about the fruit. I prefer to grow the varieties that I have been growing for years. Just planted enough of those newer varieties to test them.

Member. Do you get any fruit the third year?

Mr. Boyer. Sometimes a few, but I always aim to grow the trees before I grow the fruit. You can grow a pretty fair crop in three years but it is at the expense of the tree. It does not pay.

Member. Do you believe in pruning at any time during the summer months?

Mr. Boyer. In July or August. I could show you thousands of trees that I trimmed last August.

Member. Do you prefer that to winter pruning?

Mr. Boyer. I do, because when the season comes we are ready to spray.

Member. In your locality do trees make much young growth after they bear?

Mr. Boyer. They do. I can only speak of my own locality. I do not consider a peach orchard profitable after ten years. It is better to start a new one and take the old trees out. I would sooner spend my time on a young orchard.

Member. How many years have you been practicing summer pruning?

Mr. Boyer. About seven.

Member. How do you find time to prune in July and August?

Mr. Boyer. I am talking about young orchards now.

Member. How many baskets do you pick off a four-year-old peach tree?

Mr. Boyer. About two.

Member. Do you aim just to grow especially nice large peaches and put them in carriers or do you put them in baskets?

Mr. Boyer. Baskets. I use carriers sometimes, too.

Member. Do you find it more profitable in baskets?

Mr. Boyer. That depends upon the crops in New Jersey, Maryland and the southern states. You have to watch the market. Some seasons it pays to use carriers and sometimes not.

Adams County York Imperials—"None Better Grown."

THE INFLUENCE OF FERTILIZATION AND OTHER FACTORS UPON YIELD, COLOR, SIZE AND GROWTH IN APPLES.

Dr. J. P. Stewart, *Experimental Pomologist, State College, Pa.*

The Pennsylvania Experiment Station has been conducting experiments bearing upon the above subject, during the past five years. Altogether, it has now in operation 18 such experiments, involving 11 soil types and 3660 trees. In many respects, this series of experiments is by far the most comprehensive of any similar series thus far reported in America. In number of soil types; in the number of treatments and checks; in number, variety and range of age of the trees; in duplications of the experiments of a given type; in the amounts of fruit involved; and in the fact that the experiments are distributed over the state and located as a rule in regions generally recognized as being well adapted to apple production—in all these respects we believe that the Pennsylvania orchard experiments enjoy distinct advantages over most previous efforts to answer the questions involved.

The results considered in the present paper are chiefly from 10 experiments, containing 2219 bearing trees and involving 10 different soil types. Some of the general features of these experiments are given in Table I.

Table I. Location, Soil Types, Varieties and Trees in Experiments Away From the College.

Expt. No.	County.	Soil.	Varieties.	Age 1911	No. of trees.
215[1]	Adams	Porters loam	York & Stayman, ...	12 yr.	160
216	Franklin	Montalto fine sandy loam	York & Jonathan, ...	12	160
220	Bedford	DeKalb stony loam	York & Baldwin, ...	13 & 23	160
217	Franklin	Montalto loam	York and Gano, ...	18	358
218	Franklin	Hagerstown clay loam	York & Albemarle, ...	12 & 16	400
219	Bedford	Frankstown stony loam	York, Jonathan, Ben Davis & Gano, ...	9	320
221	Wyoming	Chenango fine sandy loam	Spy & Baldwin, ...	39	115
336	Chester	Chester loam	Grimes, Smokehouse & Stayman, ...	9 to 11	120 & 105[2]
337[3]	Mercer	Volusia silt loam	Spy, Baldwin & Rome	4	180 & 180
338	Lawrence	Volusia silt loam	Baldwin, ...	23	80 & 105
339	Bradford	Lackawanna silt loam	Baldwin & Fallawater,	17	120 & 16

It will be noted that the soil types range from heavy clay loams in experiment 218, through silt and plain loams to light sandy and stony loams, in experiments 216 and 219.

The first three experiments deal with the influence of fertilizers, and involve 10 treatments and 6 checks in each case. The next four experiments deal with cultural methods and involve 12 treatments in each case, except the last, which has six. The last four experiments are a combination of portions of the first two types and deal with both fertilizers and cultural methods.[4] As shown in the table, the trees are of 10 varieties, though with one

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[1] The names and addresses of the owners of the orchards in which these experiments are located are as follows: 215, Tyson Brothers, Flora Dale, Pa.; 216, D. M. Wertz, Quincy; 220, Mrs. S. B. Brown, Manns Choice; 217, J. H. Ledy, Marion; 218, Ed. Nicodemus, Waynesboro; 219, J. H. Sleek, New Paris; 221, F. H. Fassett, Meshoppen; 336, A. Darlington Strode, West Chester; 337, A. M. Keiffer, Greenville; 338, J. B. Johnston, New Wilmington; 339, F. T. Mynard, New Albany.

[2] In the two sets of figures in this and the following experiments, the first gives the number of trees under fertilizer experiment, the second those under different cultural methods. In Experiment 339, the latter includes only a mulch plot.

[3] Trees set out in connection with these experiments and not yet in bearing, hence excluded from consideration at this time.

A Thrifty Orchard on Hagerstown Clay Loam.

exception there are two or more varieties in each experiment. In age at the present time, the bearing trees range from 9 to 39 years; and since the work started they have produced over 1,315,000 pounds of fruit.

In this one item of fruit, we may call attention to the facts that, so far as American experiments are concerned, this amount is more than treble that reported in any other single experiment, and very distinctly more than the total fruit reported from all other similar experiments combined. This does not mean that the importance of the experiments elsewhere is to be minimized in the least, but it should help to emphasize the fact that, in those cases where conclusions or attitudes are in conflict, very careful attention should be given to the actual and relative amounts of evidence upon which the differing attitudes are based. In fact, within our own experiments we can find the counterparts of practically all those reported elsewhere. If we had fewer experiments—for example, only one on fertilization and another on cultural methods,—our conclusions could be much more easily formulated, and we might readily become ardent partisans on either side of the questions, the side depending merely upon which of the present locations our experiments chanced to have. In other words, if we attempted to base our conclusions upon any one or two of our present experiments, those conclusions would be very different from any we would now formulate, on the basis of all the results. There can be no doubt that when the whole truth is known, we shall be able to account for *all* of the facts, and this is what we are undertaking to do.

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[4] For further details, see our Bulletin 100 and our Annual Report for 1910-11.

The Influence of Fertilization.

The first factor to which we shall give attention is that of fertilization. Can the yield, color, size and wood-growth[5] of apples be influenced by fertilization, and, if so, how and under what conditions? This has always been an important question, and five years ago, when we were starting our experiments, we could find no data upon which to base a definite, well-founded answer. We do not say that we can fully answer it yet, but such progress as we have made may be partially seen in Tables II and III.

Table II. INFLUENCE OF FERTILIZERS ON YIELD. (*Johnston Orchard, Experiment* 338).

(Total yields of fruit on each plot and annual yield per acre.)

Plot	1 Check	2 N.P.	3 N.K.	4 Check	5 P.K.	6 N.P.K.	7 Check	8 Manure	9 Lime	10 Check
yr.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1908, ..	90	528	237	446	57	759	211	278	558	106
1909, ..	675	6,018	5,257	1,932	3,089	6,621	2,008	3,531	1,216	1,266
1910, ..	2,575	3,265	1,822	3,168	3,552	2,108	1,629	6,149	3,185	3,505
1911, ..	283	7,563	7,816	617	1,227	8,209	1,362	4,874	388	106
3-year totals,	3,533	16,846	14,895	5,717	7,868	16,938	4,999	14,554	4,789	4,877
Bushels per A.,	141.3	673.8	595.8	228.6	314.7	677.5	200	582.1	191.5	195

Table III. EFFECT OF FERTILIZERS ON YIELD. (*Johnston Orchard*).

(Average returns from certain treatments during past three years.)

Treatment	Checks (Av. 1, 4, 7, 10)	Manure (Plot 8)	N-Fertilizer (Av. 2, 3, 6)	P.K.-Fertilizer (Plot 5)
Totals 3 yr., ...	4,781 lb.	14,554 lb.	16,226 lb.	7,868 lb.
Ratios, ...	100	304.4	339.4	164.5
	....	100	111.5	....
Average An. Yield per A.,	191.2 bu.	582 bu.	649 bu.	314.7 bu.
Av .Gain per A., ..	....	390 bu.	457 bu.	123 bu.

These tables are from one of our "combination" experiments, involving both fertilization and cultural methods, and started in 1908. The fertilizers have therefore had a chance to affect the crop only during the past three years, and it is for that period that the totals and annual yields per acre are computed.

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[5] Quality is omitted from consideration at the present time, not because we do not consider it important, but because as yet we have no measure of quality sufficiently accurate and impersonal to enable us to make satisfactory comparisons of the fruit under different treatments.

Even a glance at these tables can leave no doubt as to the positive and profound effect of *proper* fertilization on the yield of apples. It will be noted that the checks run fairly uniform, averaging a little over 190 bushels per acre annually. Lime applications (at the annual rate of 1,000 pound per acre) have given almost exactly the same returns as the average check. The phosphate and potash combination has affected yield in this case rather decidedly, having raised it by 123 bushels per acre. This may be partly due to a slight superiority in location, as indicated by the fact that its adjacent check is the highest in yield and is within 86 bushels of the phosphate-potash treatment. While this increase in yield is fairly satisfactory, there is nothing in the growth or appearance of the trees of plot 5 that would lead one to believe that their treatment is appreciably superior to that of the checks. In other words, the trees of plot 5 still look starved and indicate that there is something else lacking, although it will be noted that this is the fertilization ordinarily recommended for orchards.

This lack is very decidedly met by the manure treatment of plot 8. In this plot, the trees are making a luxuriant growth, both in wood and foliage, and the yields have been increased by 390 bushels per acre annually,—a very satisfactory exchange for 12 tons of stable manure. Even this increase in yield, however, is considerably less than those obtained on the plots receiving a nitrogen-carrying fertilizer. Under the latter treatment on three plots, the *average annual yield* has been increased from 191 bushels on the checks to 649 bushels on the fertilized plots, or an annual *increase* of 457 bushels of apples per acre. This resulted from fertilizer applications that actually cost less than $17, and the essentials of which can be bought at retail for about $10 per acre. During the past year,—the fourth year of the experiment,— as shown in Table II, the yield on plots 2 and 3, compared with that of their adjacent checks, was at the rate of 17 to 1, the yield on the checks being at the rate of 54 bushels per acre, while that on the intervening nitrogen plots was 922 bushels. Surely it is not necessary to further defend the thesis that *proper* fertilization may very profoundly affect the yield of apples.

There is no reasonable possibility of these results being due to any other agent than the fertilizers. The trees are all of the same variety and same age. They receive the same spraying, pruning, soil handling and other care. The soil is practically level and very uniform. The treatments are abundantly checked. In fruit, foliage, growth and general health of trees, the benefits stop abruptly where the fertilizers stop, and similar results are being obtained by the owner in other parts of the orchard, on the same and other varieties, with the combinations of fertilizers found effective in the experiment.

In regard to the relative values of the different fertilizer elements, it will be seen in Table II, that nitrogen is evidently the first limiter. Thus, the phosphate and potash combination in plot 5 has given an increase of 123 bushels per acre, while by the addition of nitrogen to this combination, in the adjacent plot 6, we get an increase of 486 bushels. In other words, the addition of nitrogen to the treatment ordinarily advised for orchards, resulted here in nearly quadrupling the benefit. In plot 3, where the phosphates are omitted, it will also be noted that there is an annual deficit which amounts to nearly 80 bushels per acre. This doubtless indicates that phosphorus is the second limiter and that the yield in plot 3 is being reduced by lack of this element. Potash applications, on the other hand, have been practically of no avail in this experiment. This may be seen by comparing plots 2 and 6. The annual addition of 150 pounds of actual K_2O in the latter treatment has resulted in a gain of only 3.7 bushels of apples.

The above results were obtained without any aid from tillage or cover-crops, the fertilizers being merely sowed over the surface of untilled soil, on which there was a light sod composed chiefly of mixed grasses. Here the question may be raised as to whether equal or superior benefits may not have been obtainable with some form of cultural methods. This question is answered in Table IV.

Table IV. CULTURAL METHODS AND FERTILIZERS ON YIELDS. *(Johnston Orchard).*

Plot	XIII	XII	XI	(Av. 2 & 6)
Treatment	Sod	Sod-Mulch	Tillage and Cover Crop	N-P-Fertilizer
	lb.	lb.	lb.	lb.
1908, ...	1,170	2,265	2,843	2,813
1909, ...	17,982	7,455	10,702	27,649
1910, ...	2,940	16,789	17,254	11,752
1911, ...	3,550	2,629	7,500	34,502
Totals last 3 yrs., ...	24,472	26,873	35,456	73,903
Ratios, ...	100	109.8	144.8	302
Ratios, ...	......	100	131.9	275
Ratios, ...	......	......	100	208.4
Average Annual Yield per Acre, 3 yr., ...	223.7 bu.	245.7 bu.	324.1 bu.	675.7 bu.
Average gain per A., ..	.....	22 bu.	100 bu.	452 bu.

In this portion of the experiment, which is devoted to cultural methods, the plots are larger and contain 35 trees in each. The yields of plots 2 and 6, from the fertilizer portion, therefore, are raised to their corresponding values for plots of equivalent size. No fertilizers were used on the cultural methods plots, until the season just past. They were used then uniformly on all treatments, primarily because the sod plot had gone two years with very little fruit, though all the trees of these plots were plainly in need of something additional.

In Table IV the sod plot shows a little higher annual yield than the average of the checks in the fertilizer portion, this being due to an exceptional crop that occurred on this plot in 1909, and from which the plot has not yet recovered. In the next plot, we see the effect of adding a mulch to the sod treatment. In this case, although all the herbage that grows is left in the orchard, and a further application of 3 tons of straw per acre is added to the plot, the average annual gain is only 22 bushels per acre. In the next plot, we find that tillage and leguminous cover crops have given a fair increase, amounting to 100 bushels per acre on the average. This, however, is hardly to be compared with the 452 bushel increase shown in the next case, which is obtained without tillage of any kind, merely by the addition of a fertilizer that carries the elements that are evidently lacking.

In some quarters one would gather the impression that apples can scarcely be grown without tillage. While we have nothing against proper tillage as an orchard treatment, yet this and other results from our experiments show that it is by no means indispensible in the production of first grade apples and that it can be readily over-emphasized like anything else. There are many situations that are otherwise very well suited for apples, where tillage is decidedly inadvisable, and where, with proper management, the trees would get along very much better without it. In such situations it is undoubtedly preferable to sow the orchard down to some leguminous crop as a permanent cover and follow the mulch system, properly supplementing it with fertilization. For this purpose, hairy vetch is doubtless preferable, on account of its relatively low moisture draft, and its usually excellent staying powers when once well seeded down. Whenever it is crowded out by the grasses, the orchard may be re-plowed and again sowed to vetch, if the trees seem to require it.

Data on Fertilizers from Other Experiments.

Thus far we have confined our attention to a single experiment, primarily because the contrasts in it are so great that both the existence and nature of the effects could scarcely fail to be recognized. To go through each experiment in this way would be impossible in our present space, hence we have condensed into the next two tables a statement derived from the results of six experiments, including the one just discussed. These tables show the average effects of the different fertilizer elements, obtained in six experiments, during periods covering from three to five years as indicated. The effects are calculated as closely as possible and are expressed in terms of per cents. of benefit based on the normal performance of the treated plots. The methods followed in making the calculations are described briefly in our Bulletin 100 from the Pennsylvania Station, and described in full in our Annual Report for 1910-11.

Table V. EFFECT OF FERTILIZER ELEMENTS ON YIELD, COLOR, SIZE AND GROWTH.

(Calculated Percents of Benefit.)

	Yield		Color	Size	Growth
Expts. 336, 338 & 339	1908-11	1911	1909-11	1909-11	1908-11
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
Nitrates in combination, ...	94.05	163.1	—13.3	—4.81	24.11
Phosphates in combination, .	36.65	35.8	—.95	4.04	—3.97
Potash in combination, ...	—4.65	—6.42	—.1	13.2	4.17
Complete fertilizer, ...	122.5	166.4	—16.0	5.93	27.50
Manure, ...	144.1	169.8	—14.3	30.8	37.49
Lime alone, ...	19.5	—3.07	—2.9	19.4	8.04

Table VI. FERTILIZER ELEMENTS ON YIELD, COLOR, SIZE AND GROWTH.

(Calculated Percents of Benefit.)

	Yield		Color	Size	Growth
Expts. 215, 216 & 220	1908-11	1911	1908-11	1908-11	1907-11
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
Nitrates in combination, ...	41.7	18.05	—12.35	—1.67	14.83
Nitrates alone, ...	30.0	39.10	—16.00	—6.23	18.33
Phosphates in combination, .	15.4	9.35	—1.55	.925	.62
Phosphates alone, ...	—7.4	—7.37	2.80	—1.21	.52
"Floats" alone, ...	—18.8	6.4	7.70	—1.92	—6.00
Potash in combination, ...	15.2	12.80	6.55	5.67	2.71
Complete fertilizer, ...	68.8	65.7	—16.00	4.30	19.10
Manure, ...	101.—	221.90	—9.90	4.73	24.70
Lime alone, ...	—12.0	15.1—	.8	—1.05	3.1

In general, these tables corroborate and extend the deductions obtained from those already considered. The addition of the results from the other experiments have reduced the apparent benefits somewhat and the relative values of certain materials are also slightly changed. We have included the results of the first year in the yields of Table V, which also reduces the apparent benefits, since the fertilizers had not yet had time to operate. Even at that, however, we see that the yields during the 4-year period have been nearly doubled by the addition of nitrates, in experiments 336, 338 and 339 and with the same material they have been increased by 41 per cent. in the younger experiments of Table VI.

Phosphates, when used in combination with nitrogen or in a complete fertilizer, maintain their position as the next limiter after nitrogen, though they are closely pressed by potash in Table VI. On the other hand, neither acid phosphates nor "floats" nor lime, when used alone, have shown any consistent benefits on yield thus far. Their apparently *negative* influences on yield may be smoothed out in time, as indicated by some of the results of the past year. There is some evidence, however, that certain of these negatives really indicate a toxic action that is manifested only under certain conditions, but we have not yet carried this far enough for definite statements.

The important advantage shown by manure, especially in Table VI, is doubtless largely due to the very full crops on the manure plots of those experiments during the past year, which was rather of an off year for the similar plots receiving complete fertilizer. The better moisture-conservation under the manure and the larger amounts of plant food carried in it also probably account for a part of the superiority. In general, however, we do not find any important superiority in manure over a proper commercial fertilizer, neither in actual nor net increases. Manure is undoubtedly a safe and valuable material to apply in orchards, when it can be satisfactorily obtained in sufficient amounts. But with very few exceptions, thus far in our experiments as a whole, wherever manure has given important increases, these increases have been approached or surpassed by a proper commercial fertilizer.

Correlation Between Yield and Growth.

In regard to growth, it will be observed that, in general, the improvements in it have accompanied those in yield. The same materials that have improved the one have generally improved the other. In other words, as a rule, our best growing plots have been our best fruiting plots. Contrary to a prevalent notion, therefore, we may say that growth and fruiting are not necessarily antagonistic, but rather are associated, unless either should occur in abnormal amount.

Data and Deductions on Color.

In regard to color, it will be observed in Tables V and VI that none of the applications have given any important increases, and most of them have given decreases. Similar results have also been uniformly obtained elsewhere, so far as we have received the reports. The same is essentially true of applications of iron salts. From these and other considerations, therefore, we believe that color in apples cannot be materially *improved* by soil applications, and that it is *primarily dependent on maturity and sunlight.*

This refers only to the red colors in apples. The yellow colors can probably not be affected by any external agency. Physiologically, the yellow color is connected with certain bodies located in the superficial layers of cells in the apple skin. It develops independent of light, and its intensity depends merely upon the degree of maturity or ripeness. The red color, on the other hand, is a constituent of the cell sap; it is capable of being influenced by a number of agencies; and its intensity is dependent primarily upon the amount of light received during the latter stages of maturity. In other words, we get back to its dependence upon maturity and sunlight. Conditions increasing one or both of these factors, such as late picking, light soils, open pruning, and sod culture will increase color. Opposite conditions decrease it.

From this viewpoint, the reduction in color caused by the nitrates and the manure is easily explained. It is evidently due to delayed maturity. That such is the case was shown the past season, especially in the Johnston orchard, where the fruit of the nitrogen plots was left on the trees until it reached approximately the same stage of maturity as that on the checks when they had been picked. The difference in the dates of picking, which correspond closely with the delay in maturity, was exactly three weeks, —from September 28th to October 19th. And when the final picking was done, the amount and brightness of the color on the nitrate plots was actually greater than it had been on the checks. The average increase in color on the treated plots, 2, 3 and 6, over the checks, 1, 4 and 7, was actually as great as 10.3 per cent. The great importance of maturity on the trees in increasing color is thus clearly shown.

The importance of sunlight, we had already determined in an earlier experiment. In it, we found that after the apples were picked, exposure to sunlight increased their redness by 35 per cent., while the checks in the dark and those exposed to electric light showed no definite increase.

We may also mention the facts that color may be materially affected by certain kinds of spraying and by internal variations such as appear in the solid-colored variants from the Gravenstein and 20-Ounce. These points also are discussed in our Annual Report for 1910-11, but space is too limited for further consideration here.

Relation of Fertilization to Size.

Again referring to Tables V and VI, we see that nitrates have apparently reduced the average size of the fruit. Phosphates have given only a slight benefit, if any; while potash and manure have given quite important increases. This apparent benefit from potash is interesting, and it may indicate an actual fact, since size depends so much upon moisture and potash has been credited physiologically with the ability of increasing the osmotic power of plant cells.

All these apparent influences on fruit-size, however, must be considered in their relation to the size of the crop on the trees. A year ago, we plotted a number of curves from data given in connection with a fertilizer experiment at the New Jersey Station, in order to determine definitely, if possible, whether any relation existed between these two factors—fruit-size and size of the crop on the tree. We found that no correlation exists below what we may call a certain critical point, and that, under the New Jersey conditions, the number of fruits on even moderate-sized trees had to exceed about 1400 per tree before any perceptible correlation appeared. *Above this critical point,* however, it is probable that *crop-size is the dormant influence on the size of the fruit,* though the exact position of the critical point may doubtless be raised or lowered somewhat by local conditions of moisture, plant food, etc.

In our judgment, this has a bearing upon the fact that nitrogen has apparently failed to increase the size of the fruit in our experiments. The crop-size was raised so much that full size of the fruit was not obtainable.

It also has an important bearing upon thinning. It means, in general, that if one thins an apple tree of even moderate size before the number of fruits has reached a critical point, which may be 1400 or more, he can hardly expect to modify the size of the remaining fruit, and the most effect of the thinning will be an actual reduction in total weight of apples at least for that year. Exceptions to this may appear in varieties of extra large sizes, or in seasons or locations that are exceptionally dry.

It also means that, below the critical or the thinning point, there is opportunity for the other factors to exert their influence. It is here that such factors as fertilizers, cultural methods, moisture-supply, and heredity show their effects, and they may co-operate in such a way as to materially raise the critical point. This assumes that the variety is properly located in respect to temperature and length of growing season, both of which are factors that may have an influence on fruit-size. We also may mention here the factors of pollination and number of seeds per fruit, which have been found to affect fruit-size by Frost and Muller-Thurgau in Germany.

A Suggested Fertilizer Formula, with Conditions and Time for Application.

Having thus seen something of the possibilities of fertilizers in orchards, it remains to point out some of the practical applications. In general, we may say that where there is probability that plant food is needed, a good fertilizer is one carrying about 30 pound actual nitrogen, 50 pound actual P_2O_5, and 25 to 50 pound K_2O

per acre. In many cases, the smaller amounts of K2O will doubtless give better net returns than the larger, though there are some soils where this is apparently not the case. In certain of our cultural methods experiments, a fertilizer similar to this has very good results, especially in connection with tillage. In some cases in connection with sod or mulch treatments, however, it has seemed probable that the nitrogen was hardly sufficient in the above formula, though this is a point that will have to be determined more or less by local trial. The nitrogen can, of course, be furnished by manure or leguminous plants to a greater or less extent, if this is found desirable.

In a few of our orchards, moreover, no form of fertilization has as yet produced a material response. This we consider due to the presence of other limiters, of which *improper* moisture supply is frequently important: though there are many other possible limiters.

The existence of such orchards emphasizes the need of local tests before making large and regular expenditures for fertilizers. These tests can be readily made by treating one part of the orchard and leaving the remainder unfertilized. In the case of most young orchards, or in any orchard that is doing well in growth and fruiting and retains a thrifty foilage well through late August and September, it is doubtless *safest* to fertilize only a small portion of the orchard for two or three years and leave the larger part unfertilized. The fact that the trees are well loaded in a given year, however, is no sufficient reason for omitting the fertilizer that year. In fact, that is one of the best reasons and times for applying a proper fertilizer rather liberally, in order to prevent the total absence of a crop the following year, and in the long run to tend to steady the annual production.

In case of the reverse conditions,—old orchards or those not retaining a thrifty look throughout the season or not growing and bearing satisfactorily,—it is best to reverse the procedure, and fertilize the larger portion, leaving only a small block to test the value of the treatment. In all cases, however, we strongly advise the use of a check until the real value of the treatment is well established. It is neither desirable to throw away money by too much liberality in the treatment of a crop, nor to fail to realize its possibilities by too niggardly a treatment. Either course is an economic blunder, and the latter is especially deplorable because its effects is to decrease the productivity of the whole nation.

The time of application also we consider important, especially in the case of the nitrates. While our evidence is by no means complete on this point, yet we believe that it is quite posible to make the applications either too early or too late for satisfactory results. In fact, we have some evidence, from the work of certain orchardists, that leads us to believe that very distinct harm may be done by applying nitrogen too near to the fruit-setting time, especially in the case of peaches. Other evidence indicates that nitrates applied too early in the season may be wholly lost to the trees.

So that all things considered, we feel that nitrates should be applied not earlier than petal-fall in apples and probably not later than the 1st of July, though some of our best results have come from applications as late as July 8th. Most any time during the period indicated will probably get the most out of the nitrate applications.

With the other less soluble and slower acting materials, the time of application is much less important. We know some careful observers, who even advocate the application of phosphate and potash in the fall on peaches, and claim that they get the best results in that way. Our own feeling on this is that the time of application for the mineral fertilizers is of relatively little importance. In any event, they are rather quickly fixed in the soil and they do not leach readily. Hence, we apply them along with the nitrogen, letting the time of application for the latter, which we do consider important, govern for all.

Fertilization and Cultural Methods for Apple Orchards.

R. A. Wickersham. What would have been the result if you came into this section where they have good soil?

Dr. Stewart. We got some very good increases in our experiment in the Tyson orchard this past year, which was the first full crop on this experiment.

Member. Do you prefer Nitrate of Soda?

Dr. Stewart. We use it as a carrier of about half of the nitrogen. Dried blood or other carriers should be satisfactory for the remainder.

Dr. Mayer. Is the nitrate plowed in or harrowed in or put on the surface?

Dr. Stewart. It is put on the surface and left there to be washed down in some cases, while in others it is harrowed in. I should not plow it in.

Member. What variety in the Johnston experiment?

Dr. Stewart. Baldwin.

Member. Did you try lime on sod?

Dr. Stewart. Yes, we tried it every way.

Member. Did you try Basic Slag?

Dr. Stewart. Not yet. We expect to begin something with it next season.

Member. Are you going to give us the formula?

Dr. Stewart. Yes, we will come to that afterwhile.

Mr. Newcomer. How about the color of the fruit, is it a high, brilliant color?

Dr. Stewart. When we picked the fruit on the N-plots of the Johnston experiment this year, there was more color and brighter color on them than had been on the checks.

Mr. Allis. Have you figures on the average cost of fertilizer?

Dr. Stewart. $14.00 per year. $14.00 per year has given us an annual increase of 450 bushels of fruit.

Member. How about the treatment where the grass grows rank?

Dr. Stewart. If the grass grows rank, I would try to get rid of it. I would plow it up and plant vetch.

Member. Have you had very good cover crops in that orchard?

Dr. Stewart. Yes, very good cover crops. Many of them as fine as could be.

Member. Won't the roots get so near the surface in a few years that the mulch and manure will not have much effect?

Dr. Stewart. This has not occurred in five years. I would not attempt to say what is going to happen in the next five.

Member. What is the relative cost of the two?

Dr. Stewart. The cost of manure is usually much greater. The commercial fertilizer that we are suggesting costs about $10.00.

E. C. Tyson. When you speak of $10.00, do you mean $10.00 per acre?

Dr. Stewart. Yes, $10.00 per acre.

Member. The comparison in results between manure and fertilizer is hardly fair. The manure would cost us about $30.00 in place of $10.00.

Dr. Stewart. Well, it is certainly not against the manure. There is much more plant food in it. It is much in favor of the manure, so far as that is concerned.

Dr. Stover. Which one pays best according to your chart, so far as your expenses are concerned and the results obtained?

Dr. Stewart. So far, I should say that in general we have a good deal more net gain out of a properly compounded fertilizer. The net results thus far have been greater.

Relative Values of Fertilizers in Tyson Orchard.

The relative values of the different fertilizer elements as indicated by the results in the Tyson experiment, No. 215 are of considerable local interest, hence the yields in this experiment are given separately. They are shown in Table VII for the last four years, the fertilizers having been applied first in 1907.

Table VII. Yields in Fertilizer Experiment 215. *(In Tyson Orchard).*

(Yields in pound per plot, 1908-11.)

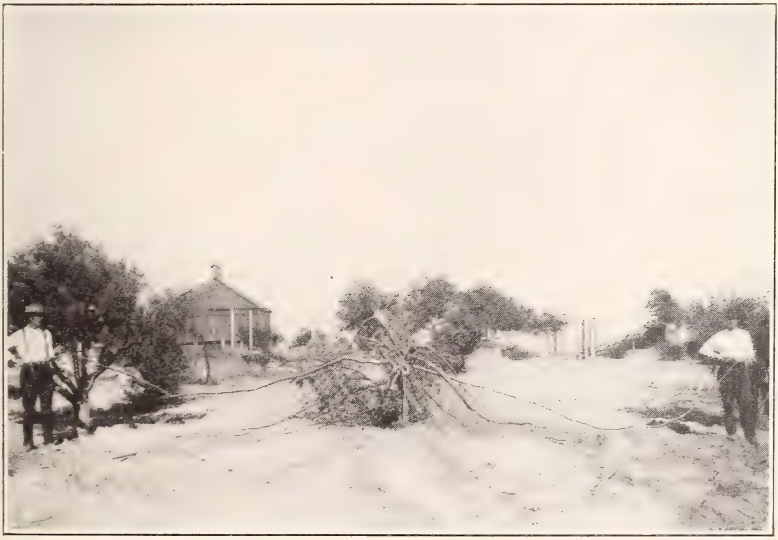
Plot	Treatment	1908	1909	1910	1911	Totals	Per Cent. Benefit
1	Check, ...	14	95	346	2,053	2,508	......
2	Nitr. & Phos., ...	26	73	301	2,277	2,677	16.3
3	Nitr. & Potash, ...	43	115	418	3,043	3,619	72.6
4	Check, ...	21	54	260	1,555	1,890	......
5	Phos. & KC1, ...	26	146	476	2,828	3,476	78.0
6	Phos. & K2SO4, ...	61	179	483	2,352	3,075	52.8
7	Check, ...	18	45	235	1,777	2,075	......
8	Comp. Ftlzr., ...	21	74	300	2,885	3,280	64.4
9	Nitrogen, ...	17	83	239	1,746	2,085	8.9
10	Check, ...	17	89	150	1,579	1,835	......
11	Acid Phos., ...	3	43	153	1,359	1,558	—18.5
12	Raw Phos., ...	4	62	164	2,010	2,240	12.6
13	Check, ...	31	46	103	1,886	2,066	......
14	Manure, ...	15	52	190	2,333	2,590	24.2
15	Lime, ...	27	86	186	1,765	2,064	—1.9
16	Check, ...	10	76	115	1,922	2,123	......

Total fruit involved, last 4 years 39,161 lb.

As shown in the table, the first important crop on these trees appeared in 1911. Although some rather conspicuous differences were brought out by this crop, and also in some of the totals we are reserving judgment in regard to the significance of the results here until we get further returns. The figures are given, however, so that those interested may see just what the results to date are, and draw their own conclusions. There are some slight irregularities in this experiment in age of trees and of Stayman grafts, but we have made corrections so far as possible to eliminate their influences.

A careful study of this table brings out the rather surprising fact that thus far the ruling element on yield here has not been nitrogen, but potash. The relatively low influence of nitrogen is consistently shown in the results of plots 2 and 9 and also in the manure plot. The strong influence of potash is shown just as consistently in the results of plots 3, 5, 6 and 8. It is evident, therefore, that so far as can be judged from present indications in this experiment, a fertilizer relatively rich in potash should be used.

These indications may be connected with certain things in the previous treatment of the soil here and with the fact that the usual orchard tillage has been maintained over the tree roots. Thus the necessity for nitrates has doubtless been reduced. The appearance and growth of the trees on the nitrogen plots, however, is such that we prefer to await further returns, before coming to any final decisions.



Showing expanse of roots (15 feet on one side and 18 feet the other side) of tree set deep in 1897. Tree 13 years old when dug.

Packing Fine Adams County Apples.
(Mammoth Black Twig.)

SIZE, COLOR AND QUALITY IN FRUITS.

Dr. U. P. Hedrick, *Horticulturist, New York Agricultural Experimental Station, Geneva, N. Y.*

Mr. President, Ladies and Gentlemen: It is a genuine pleasure for me to meet the Adams County Fruit Growers' to-day. My acquaintances and colleagues in New York, who have been here, have brought home glowing tales of the wonderful fruit region you have in Adams County, of the hospitality of the people, and the good meetings you have in this Association, and have had here for years. It is all the more pleasure because I feel that the two states, the one bounding the other, ought to be in closer contact in matters pertaining to fruit growing than they are. My subject to-day is "Size, Color and Quality in Fruits." I want to discuss the relative values of these three principal characters in fruit in particular, in regard to their great importance to this state.

You are all aware that there is a discrimination against some of the fruits of the East. Side by side fruit from the far West is preferred in the markets of the country. None of us like the sound of this but it is well to face postive facts no matter how disagreeable. This discrimination is unjust for when the same market grades of most eastern and western fruits are compared, connoisseurs find the eastern the better. Unfortunately, public opinion does not always march with the opinion of the connoisseurs. The difference between professional and popular judgment in this matter comes about because of the general misconception of the relative value of size, color and quality in fruit. It is to a consideration of the values of these attributes that I ask your attention for a short time with the hope of suggesting something to stem the present comparative unpopularity of the products of eastern orchards.

Appreciation of fruits comes through three of the five senses—taste, sight and smell, though the last is of little importance, being so intimately connected with taste as to almost be a part of it. The senses of taste and sight remain. We grow fruit to eat and it would, therefore, seem that taste should set the seal and symbol on a good fruit. But somehow a great number of people imagine that size and color are of more importance than quality and judge fruit by the eye rather than by the mouth. A misunderstanding, it might be said a quarrel, has thus arisen between the advocate of taste and sight. Extremeness of view, misapprehension of purpose, and not a little intolerance, is shown on both sides. Let us discuss fairly and without prejudice the properties of fruits which give them value.

When the nurseryman sets his net, in shape of an illustrated catalogue, for the fruit grower, he baits it with gorgeous illustrations showing fruits of heroic proportions. The most frequent descriptive phrase accompanying this alluring bait is, "of largest size." In his turn the fruit-grower usually makes an exhibit, or a sale, or a present of his wares, with the apologetic yarn that he kept the largest for his own use, or he had larger last year; or, if you catch him in his orchard he lets you know that he could grow larger fruits if he were only so disposed. All this shows a craving after size—a craving that has been bred and is now stimulated by competitive exhibitions in which size is usually given first place. This has gone on for so long that now in the eyes of the "average person," personification of what we call the public, size is esteemed about the highest quality a fruit may possess. This feeling finds expression many times at every fruit exhibit when onlookers remark in a deprecatory tone, "I've seen lots of apples larger than those." What are the true merits of size in fruits? The question needs careful consideration. We cannot make advance in horticulture until we know what we want.

In tree fruits for the kitchen, fair or large size is distinctly meritorious, saving waste in paring and coring or pitting though even here there are exceptions for one does not want a huge baked apple, a mammoth peach for canning, nor large plums for preserving. But for all dessert purposes the medium sized fruit should be preferred and the Fameuse or a little Lady apple, a Seckel or Doyenne pear, a Crawford peach and a Green Gage or Jefferson plum are, or should be, as acceptable as any varieties of their kinds. Certainly no one wants to make two bites at a cherry, strawberry, or any of the small fruits. Size in fruit is often poor economy whether on the fruit stand, in the hotel or for the home, for a small or medium fruit frequently answers the same purpose that a larger one would. It is true that some of the varieties of our tree-fruits might be increased in size to advantage and the value of many grapes and small fruits would be enhanced by greater size.

Not always, but often, undue size in any variety is accompanied by inferior quality. This is especially true if size has been brought about by irrigation on rich land in which case the fruit may actually be said to be "bloated." The water and food are not properly assimilated, and the highly flavored solids of the normally grown fruit are diluted or adulterated with water. This is the condition of much of the western fruit which because of size and color is elbowing the less showy and less bulky eastern product to the rear. So too, extra large specimens of tree or small fruits in this region in which size is attained by high feeding or by such abnormal practices as ringing, usually lack in quality. From all this we must conclude that mere size is about the least needed quality for a good fruit.

The dispute as to whether color is more desirable than quality is just as warm as the one over size and quality. Each has stout advocates and while both are necessary in a first-class market fruit, why there should be any question about the supremacy of quality over color, is unanswerable. We grow fruit to eat. What a paradox to grow that which is unfit to eat provided only that it have high color. Here again western fruit has a decided advantage over that from the East, for the question of color is largely one of climate. The fruit from the Rocky Mountains and the Pacific Coast is certainly more highly colored than that grown east of the Mississippi. The sunlit West must ever produce fruits of brilliant hues for, like the complexion of Shakespeare's dusky Moor, the color of fruits "is but the burnished rays of the burnished sun." Yet we of the East make a fetish of color and often times laud it as being quite equal or even more desirable than quality in a first-class variety, not only a mistake in judgment, but an advertisement for the fruit of our western competitors.

Just now the fashion is for red apples and pears though red is not necessarily handsomer than any other color and certainly does not make the fruit taste better. But fashions in colors of fruits change in markets and countries just as fashions in colors of dresses or coats or hats or ties change. At one time russet apples or pears were in great demand. In some markets Yellow Newtowns, or Bellflowers, or Rhode Island *Greenings* are still preferred. Some markets like white fleshed peaches; others, the yellow fleshed. The value of a black or a red or a yellow skin on a sweet cheery depends upon the market to which it is sent. Color is for most part quite aside from the intrinsic value of any of these fruits else we should not have differences and changes in fashion. A hungry man should be as truly thankful and should say grace with just as much unction over a Yellow Newtown as over a Jonathan or a Spitzenburg.

Is high quality associated with intensity of color? A popular fallacy associates quality with color. Some say high quality is correlated with low color, hence the oft repeated phrase, "handsome but poor"; others say high quality goes with high color. Baldwin apples grown in sod are most brilliantly colored. Nine out of ten people will choose the highly colored fruit as the best flavored, but it needs only a taste to convince to the contrary. The tilled fruit is crisper, juicier and richer, a fact attested to by all who have had to do with experiments in which the fruit is grown under the two methods of culture. In this case the low colored fruit is normal while the high color is the hectic flush of disease. So in every instance, a seeming parallelism between color and quality may be explained. Individual instances seem to show correlations, but a general survey of all instances shows that there are no correlations either between kinds of color or intensity of color and quality.

I quite realize that it is necessary for a variety to have a vogue, because of some character or characters to create or satisfy a special demand, in order to "catch" the market. But need its reputation necessarily be made by its size or its color? If so, our western friends in all probabilities have us beaten. But when it comes to making a reputation for high quality, for choicely good apples, highly flavored pears, unimpeachably good peaches, and honeyed plums, the products of the middle and far West are only tolerable in comparison. Why do not we in the East make the most of the conditions that have been given us and grow fruits of quality and stake our reputation on it? Let the westerners continue to grow their huge, highly colored fruits. In time the public will distinguish between "quality fruits" and those recommended by their bulk and the color of their hide.

We come now to a discussion of quality, a word rolled under the tongue by fruit-growers and consumers alike but which like "good cheer" in the fable is fish to one, flesh to another, and fowl to a third. We need, therefore, to define the term. In brief, quality is that combination of flavor, aroma, juiciness and tender flesh which make fruits fit for the palate. But this is not all. The thing that gives charm to the attractions of the world, whether books or pictures, or music, or people, or fruits, is that subtle undefinable thing called personality. A Northern Spy, a McIntosh, a Seckel pear, a Green Gage plum, an Iona grape, for examples, all have distinct and charming personalities which contribute no small part to the high quality of these fruits. But many fruits have it not and the sorts named lose it when grown under some conditions. This personality may be quite aside from any tangible quality. It is akin to the charm of a woman of which Maggie says, in the current play, *What Every Woman Knows,* "If a woman has it she needs nothing else in the world, and if she has it not, nothing else in the world is of any use." A high quality fruit should have some such personality. Is charm marketable? It is in marriage markets. It ought always to be in fruit markets.

High quality does not have the commercial value that it should but it is coming to be worth more and more. There are two kinds of taste, natural taste and acquired taste. Only savages have a natural taste; to them crude, unrefined tasteless foods answer all purposes. But civilized man has an acquired taste and with each succeeding stage of civilization it becomes more delicate and more refined. Once they but know where it can be obtained, people will buy and pay for fruits of high quality—fruits with delicate and refined flavors and aromas and juicy tender flesh. Such fruits should be the food of the great mass of the American people while coarse,

How the York Imperial Grows in Adams County.
(Every Apple Perfect.)

turnipy fruits should go only to those who cannot tell the difference between a Jonathan and a Ben Davis, a Bartlett and a Kieffer. People need only to be educated as to what fruits are of high quality and a profitable demand will be created.

It may be asked why the fruits of the Atlantic are of higher quality than those of the Pacific sea-board! It is largely a matter, as I have said before, of food and water. But what combination of these essentials produces it is still another matter and one that we know nothing about. There are poor fruits grown in the East as well as in the West. Paul plants and Appolos waters but God gives quality. In His distribution of favors He has seen fit to characterize the fruits of this region by their quality and those of western regions by their size and color. We who have quality, have been talking most about color and size which we have not. Sober second thought should show us that we should make most of that which we have—quality.

There is of course a great difference of opinion as to which the high quality varieties are of the several fruits. This is as it should be for if all mankind liked the same varieties we should have but one sort each of the several fruits. Fruit-growing would thereby be greatly lessened and what in Heaven's name would all the nurserymen do! It is well that there are many varieties, the number is a measure of the merit, and to pick out those of high quality each man must choose for himself, wading through the dismal swamp of varieties until he finds what pleases him. The difficulty is to bring the good varieties before the public.

In what has been said I have sought to establish two facts; namely, that high quality is the chief of all the attributes of fruit; and that the fruits of the East have it in greater degree than do some of their competitors. I have presumed to say, too, that Eastern fruit-growers take small account of quality which should be their chief asset; rather do they magnify the importance of size and color, that which they have not, nor cannot have as some of their competitors do have. But there is little use in this discussion if one cannot be somewhat precise in telling how the condition that prevails can be bettered. To this end I have a few suggestions to offer—specific suggestions for individuals and general ones for the Society for this is a case where concerted action between individuals and societies is necessary. Speaking to individuals:—

First. The individual fruit-grower of this region must come to realize in growing fruits for color or size they are beaten by the West and that their long suit is to grow for quality. This is true now but it will grow more and more so as the years go by. A man should grow sorts for the market that he is willing to eat himself. If individuals will make a reputation for the high quality of their fruits, a reputation will soon be established for the region.

Second. Let every man deprecate above all things the oft made assertion that the public wants trashy stuff—cares only for appearance and not for quality. It is the fashion of the times to decry the public. Certain papers say the public wants only yellow journalism; some writers hold that the people will read only light or vulgar fiction; rag-time music is supposed to suit the public; theatres will present only sensational plays; following the fashion some fruit-growers hold that the public has the tooth of a gorilla, the taste of a buzzard, the stomach of an ostrich, and by choice fills its maw on Ben Davis apples and Kieffer pears. It is not true that the public likes poor fruit, the better the fruit the more of it will be eaten. The public is slow moving but once it learns true worth in fruit its appetitie will be for the good varieties. It will not be content with poor or mediocre sorts. If it must wipe the tongue around the mouth and titillate the palate in order to find the flavor of apples and pears, it will take to oranges, bananas, grape-fruits and pineapples.

Third. It is a good policy in this world not to break rudely with the old but to run smoothly into the new. It would hardly be wise for any man to cut down or graft over certain apples, or pears or plums, or pull out certain grapes beause they are of poor quality. But in the planting of new orchards a man should look well to the quality of the varieties he selects. Speaking broadly, and noting the Kieffer pear as the most marked exception, fruits of fine flavor can be grown as easily as grosser tasting ones. Here we have a seeming paradox for the best things in life most often come only by the greatest care and extreme labor of mind or body. In planting for the future, then, plant for quality.

Fourth. Never in the history of the world have there been so many men directing their efforts towards the improvement of plants. With the recent discoveries in plant breeding and the accumulated knowledge of centuries the efforts that are being put forth are bound to result in many new introductions within the next few years. A man may be pardoned if he clings to some of the mediocre varieties we now have for these are the elder-born to whom we have become attached in tenderly carrying them through a helpless infancy, but as the physicians and midwives of horticulture bring in the new born let us be chary of a blessing until their character for high quality is established. Let them be "born to blush unseen" and if christened let them remain in the limbo of the nurseryman's catalogue, if high quality be not among their accomplishments. Let us raise the standard of excellence and accept only new fruits which are superior in quality to their predecessors.

Fifth. The nurserymen can do much to encourage the growing of good fruit and to secure the appropriate recognition of high quality. The country is filled with men and women from city, town and country who want to grow fruit for pleasure and profit. When these embryonic fruit-growers pick the shell and get ready to plant, they go to a nurseryman for trees. Now if the nurseryman will sell all unfleged fruit-growers (the old hands should be able to take care of themselves) varieties of quality rather than what they can spare, fruit-growing and in the long run, the nursery trade, will have been helped. Some nurserymen hold it to be their inalienable right to substitute when varieties run short. If all such will only slip in a choicely good variety instead of an odd or an end, there will be less poor fruit. Nurserymen say they grow the varieties that fruit-growers want. In reality, however, they very largely force planters to take sorts that grow readily and make good looking trees in the nursery. Thus Canada Red, Winter Nelis, cherries on Mazzard, plums on St. Julian, cannot be had in the average nursery. Trees for the orchard must be grown in the nursery; trees grown in the nursery must be sold to the fruit-grower; the weal or the woe of the fruit-grower is the weal or the woe of the nurseryman. If tree-growers would push the sale of varieties and trees that are truly most useful to the tree-planter, nurserymen, fruit-growers and the public all will be gainers thereby.

Leaving now the individual there are some things that horticultural organizations can do to forward the interests of high quality fruit and hence the interests of all eastern fruit-growers.

It should be the business of eastern horticultural societies, one and all, to make the public familiar with the names and the qualities of fruits. With this knowledge fruit-buyers would pay the difference between good and poor quality varieties just as they pay the difference between a porterhouse and a pot stew. Why should they not? There are several ways of reaching the public in this matter. Fruit-growers and their customers may both gain knowledge of what are the best fruits, and which of them may be grown, by a full and frank discussion of the whole matter at horticultural meetings. County and state fruit organizations ought to do more in the way of making instructive exhibits both at their meetings and at the fairs. In these exhibits much more attention ought to be paid to fancy fruit—high quality fruit. Indeed, it seems to me that higher premiums ought always to be offered for choicely good fruits in plates or in boxes or barrels than for the varieties of poorer quality. Sometime, and it ought not be long delayed, the fruit-growers of the East ought to get together, through their horticultural organizations, and hold a monster fruit show in one of our great cities as the fruit growers of the Middle West and the Northwest are now doing yearly. These great fairs are likely to be held yearly in the West. Is the East to be behind in this matter? If such a fair is ever held we must advertise in no uncertain way the high quality of eastern fruit. This is a matter in which the East has been altogether too modest. The world thinks the western fruit is best; teach them otherwise. A rhyme of the trade once before quoted in this connection is worth repeating:—

> "He who whispers down the well,
> About the goods he has to sell,
> Does not reap shining, golden dollars,
> Like he who climbs a tree and hollers."

In conclusion: Why do I discuss this matter? Is it to encourage fruit-growing only for a select few who have the cultivated taste? Not by any means. The common taste which falls to with a vigorous appetitite upon any fruit presented is now, and must ever be, the chief customer of the fruit-grower. But taste of the multitude should be educated by all possible means for better and better fruits. Why? Because in the long run it means the consumption of a great deal more fruit the country over; and for the selfish reason that the Eastern States can grow fruit of exceptionally high quality but cannot compete with other regions in size and color of fruit. Do I hold that it is reprehensible to grow fruits of poor quality? Possibly not, but it would seem in the course of time the wiping out, root and branch, of the apple and pear industry of the East if all fruit-growers grew poor varieties; besides it would present the vile and sordid spectacle of people deliberately devoting themselves to growing poor fruit when they might as well grow good fruit. Do I say that high quality is the only requisite of a good variety? No, indeed. There are a score of requisites of fruit and tree that go to make a good variety but among these quality is not now receiving appropriate recognition and it is for such recognition that I am pleading. Is this a matter of sentiment or of business? Both. I am not averse to putting some sentiment in fruit-growing but I hope I have not been arguing before a packed jury in trying to convince this society that it is business as well as sentiment to grow good fruit. Is this not an affair to be dealt with by fruit-growers? Yes, but in most well regulated enterprises someone must have the thankless task of blowing a whistle to wake people up or to tell them that it is time to get to work. I have been tooting the whistle and if I have tooted a little long and a trifle loud it is because of some anxiety lest the fruit growers of the East should fall behind or possibly get locked out.

* * *

Trinity of Success in orcharding—

CULTIVATE—FERTILIZE—SPRAY

—*Bailey.*

Eight-Year-Old Unpruned York Imperial Apple Tree.

Adams County Grows Fine Fruit.

THE MAKING OF CONCENTRATED LIME-SULPHUR AND ITS USE ON APPLES AND PEACHES.

Dr. J. P. Stewart, *Experimental Pomologist, State College, Pa.*

Historical sketch of lime-sulphur, and advantages in home preparation.

Ingredients: Need for high purity in lime,—should be 90 per cent. CaO or better and preferably with less than 3 per cent. HgO. All present commercial sulphurs are pure enough; fineness important. Powdered commercial sulphur is preferred because of low cost.

Formula: 1-2-1, or 1-2-1.2, is best. Simple and effective. One pound of good lime enough for 2 pounds sulphur; excess of lime favors crystallization, increases sediment and fails to increase scale-killing powers. Clear solutions without extra lime here during past two summers have completely eradicated scale on apple trees, with three sprayings at summer strength.

One gallon of final product is about right for carrying 1 pound lime and 2 pounds of sulphur in home preparation. Gives a density of about 1.24 or 28½° Be'. Smaller volumes give greater densities but poor utilization of materials. Much larger volumes are uneconomical in cooking and in storing. Variations in formula for special uses and conditions.

The volume should not be permitted to run materially below desired final volume at any time during the cooking as this increases the sediment.

Utensils: Cooker, measuring stick, hydrometer and strainer. Desirable forms of each. Upward straining type of strainer is best. Cheap unstandardized hydrometers to be avoided, and they are intended to test concentrate, not to use as a float in diluting tank as an indicator of when the proper amount of water has been added.

Cooking Time: Until the sulphur is evidently dissolved, usually 40 to 50 minutes; either too much or too little boiling objectionable. Color not a safe guide. Keep pellets and lumps of sulphur broken during the cooking.

Storage: Avoid acids, CO_2, and unnecessary contact with air. Use oil films or tight, well-filled containers. Three-year old sample at the college unchanged. Crusts formed in storage may be redissolved, diluting as usual according to density.

Dilution: (a) *Process with specific gravity hydrometer.*

Rule: Decimal of concentrate divided by decimal of desired spray equals total dilution.

Examples:—

$$\frac{.24}{.03} = 8 \text{ or } \frac{.24}{.01} = 24 \text{ or } \frac{.27}{.007} = 38\ 4\text{-}7 \text{ or } \frac{.27}{.003} = 90$$

This means that a concentrate testing 1.24 is to be diluted to 1 to 8 (total) to get a winter spray for scale, which should test 1.03, etc.

(b) *Other methods:* Dilution tables and floating hydrometer in diluting vessel. Latter is unreliable as an indicator of proper water addition, diffusion too slow. (For further discussion of these and other matters pertaining to lime-sulphur, see our Bulletin 115.)

Densities and Application Times for Different Purposes.

San Jose Scale, 1.03, trees dormant; or 1.01 in summer at "hatching" time, followed by 1 or 2 later applications at ten-day intervals or as young reappear. *Other scales,* same.

Blister mite, 1.025, just as buds begin opening.

Peach leaf curl, 1.02, just before the buds open.

Apple and *Pear Scab* and apple worm. About 1.007 with lead arsenate if three applications are given; 1.01 alone, or with the arsenate if only one application is given. Applications: (1) When blossoms are beginning to show pink; (2) May begin when petals are two-thirds off and finish within ten days thereafter; (3) About two weeks after second application.

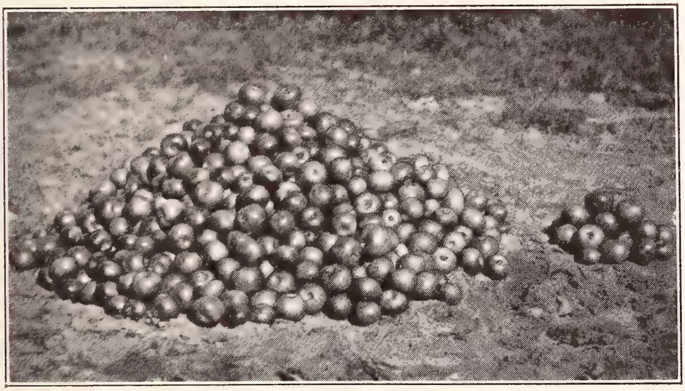
Brown Rot, Curculio and *Scab* of stone fruits. (1) Lead arsenate, lime and water (2-2-50), when calyces or "shucks" are shedding. (2) Self-boiled lime-sulphur, 8-8-50, and 2 pounds lead arsenate, about a month later. (3) Clear lime-sulphur solution, 1.003, or self-boiled lime-sulphur, without any arsenical, about 3 or 4 weeks before fruit ripens. The former alternative in (3) avoids staining of fruit, is cheaper and handier and has been satisfactorily safe in our tests the past two seasons. It should not be used extensively however, without preliminary trials in the locality and on the particular varieties to be sprayed. Peach spraying not yet as unqualified a success as apple spraying.

Spray Injury.

Sometimes very important. When the sulphur solution is used at proper densities, the injury may follow excessive applications (see our Bul. 106), or be due to reactions between the lime-sulphur solution and the arsenical, making the latter soluble. Lime sulphur solutions containing any material quantities of soda or potash are especially dangerous in the latter respect. (See our article on Peach Sprayiing in 1911 Report of State Hort. Assoc.).

We have wholly prevented the latter action on peaches during the past summer, either by using lead ortho-arsenate, $Pb_3(AsO_4)_2$, with the lime-sulphur solutions, or by precipitating the sulphur from solution with iron sulphate before adding the ordinary arsenicals. The former method is preferable, which indicates the desirability of manufacturing the ortho-arsenate here in the East as well as in California.

It also is probable that the ordinary mixed lead arsenates can be safely used with lime-sulphur solution by adding to them some free lead, preferably in the form of lead acetate or "sugar of lead," before combining them with the solution. The amount of the latter actually required depends on the percentage of soluble arsenic and of acid arsenates present in the commercial lead-arsenate sample and also on the amount of free lead already present. In general, however, one-fourth to one-third of a pound of "sugar of lead" should be sufficient to render safe the two pounds of ordinary lead-arsenate paste.



ADVANTAGES OF SPRAYING.
(Large Pile Perfect.)

Picking Adams County York Imperial.
(Nothing but Fancy Fruit in Sight.)

EDUCATING AN ORCHARD.

Clark Allis, *President New York State Fruit Growers' Association, Medina, N. Y.*

Mr. President, Fruits Growers of Adams County: I had supposed that the Garden of Eden was in Orleans County but it seems that this must be the site because this is Adam's County. In our county the chief commercial apple is the Baldwin. Baldwins and Greenings are in the lead, and will continue to lead for a long time.

Like a child, the education of an orchard should begin before it is born. When possible, buy trees of a firm who gets its buds or scions from bearing trees that bear good apples, for there is a great difference in apples. We have in one orchard what is known as "Gray Baldwins" and under no conditions are they as good as our red Baldwins. Two years ago, in cutting over $500.00 worth of scions for one of your southern nursery firms, we did not cut any from the Gray Baldwins. I want a tree to be thrifty, large and fairly straight with three or more good branches low down. I do not cut back the roots or top unless broken.

One of the first things I remember was "apple sprouts" and those "Remembers" were very painful, at home or in school, and I objected to the trimming of apple trees or boys. My father was an orchard fiend, takes after me, and all his trees were cut back to the main stalk—he had five boys. When I began to set trees for myself, I followed the same bad plan until I was convinced "beheading" young trees was not the way to make the best orchard and most money. Two farms near me were bought by city men, one man a shipshod lumber dealer who made a failure at the lumber business and the other a Polander, who did not know a tree from a boot jack; both set out young trees without any trimming at all, both set their trees next the road where I could see them at any and all times. Of course I broke that good old Bible saying "Fret not thy gizzard out" and proceeded to "Fret," but it did no good. Those fool trees grew better than any I had ever set out and it made me disgusted. I found the same conditions in a western orchard I visited. I also saw the experimental trees in which Mr. Foster Udell, "the Baldwin king" of Brockport, N. Y., proved out his belief that trimming of young trees was a mistake. His untrimmed trees were away ahead of his trimmed trees and still continue to lead. My first planting of untrimmed trees was in 1908: I set 2,000 and all started to grow but one, and but six died later. Several Baldwins at three years of age bore 40 or more large apples. This orchard at three years had many apples and next year, as a four year old, we hope for a good crop.

Orchard men tell me that I am making a mistake to let the trees bear so young, but I don't agree with them, and will not take off any apples except to thin and encourage the trees to be annual bearers. This orchard has the largest trees for its age of any orchard I have seen. Bearing apples will not hurt virgorous trees like these in the least. All the trimming this orchard has received is to cut out branches that cross; these are cut in summer. Every tree set since 1908 on our farms goes in without trimming. The past season trees set without trimming have endured the worst drought known to Western New York better than trimmed trees. I think our station at Geneva carried on experiments on this line this year, which are favorable to the untrimmed trees.

I like a low headed tree for my experience shows that trees headed low keep their large limbs farther from the ground than high headed ones. We are setting our permanent trees 42 to 45 feet apart with three fillers to each permanent tree. The trees are dipped in commercial lime-sulphur, 34° Beaume test 1 to 9. We do not dip the roots except as an experiment and have never seen any bad results from dipping the roots. The practice of dipping trees before setting is one that cannot be too highly recommended, for the dipping is so much more thoroughly done, is a great saving in time and does not require nearly as much liquid as in spraying. We spray young trees the same as the old ones.

The year before the orchard is set, I prefer to have some cultivated crop on the ground. The ground is staked out so a dead furrow comes for every row, a common or subsoil plow being used to loosen up the ground to a good depth. In planting we give the roots plenty of room, putting in fine top soil, well shaken into all cavities, firmly packed with the feet, except the last few inches which are left loose as a mulch. The trees are set deeper than they are grown in the nursery. In filling the holes, we either bank up well with loose dirt which we cultivate down to a level through the season or leave the hole below the level and throw up with the cultivator. The former way is preferable if the season is windy.

For the first few years some cultivated crop planted in hills to suit the width of the rows is advisable so the orchard can be cultivated both ways. Tomatoes or sweet corn, smaller stalks, the latter not planted too close to the trees, are good crops with some cover crop sown every year. Any of the legumes are good, but we usually sow a mixture of mammoth clover, vetch and cow horn turnips. Mr. Udell, the Baldwin grower, attributed his success to plowing his orchard using buckwheat for a cover crop. He said, "My father was the first one to use buckwheat in orchards in our section. He began its use about fifty years ago. His orchard has not failed to produce a crop in over 40 years." To derive the most good from a cover crop it should be allowed to grow until May or June; but on level ground some of our best orchardists plow late in the fall to save time in the spring. Fall plowing should never be done in hilly ground for "Erosion" is a bad man to have on the farm or in the orchard.

Spraying is the most disagreeable and costly job ever invented and "Satan" never comes around the farm at that time for there are no "idle hands," everybody works, even father, he has to keep the steam pump running water into the large supply tank. We use gasoline rigs with tanks of 300 gallons capacity. One man on the tank to drive and spray the tops, one man on the ground with a 50-foot lead of hose to spray the lower limbs. The orchards are sprayed twice before blossoming and once after. The first spraying 1 to 9 or 10 lime-sulphur for scale and blister mites. The second spraying 1 to 20 with arsenate of lead, 4 pound to 6 pound to 50 gallons. As soon as the blossoming is nearly done the spraying begins on the Greenings as they are about the first to drop their petals, using 1 to 35 or 40 commercial lime-sulphur and arsenate of lead. We have not tried spraying in August, yet will this coming summer.

This past season has been so hot and dry fungous diseases have not bothered after apples were set. Unsprayed orchards this year were free as well as the sprayed ones, but unsprayed orchards did not set much fruit. Already some are saying, "well spraying hardly paid last year so I won't do much at it this coming year." The lack of spraying on buds never showed better than for the past two seasons. Last spring a young orchard adjoining my farm blossomed full. I would have given $1,500 for his crop and sprayed it. I offered $500 per acre for this orchard. The man did not spray or work his orchard, he had a failure. A friend bought a power sprayer, but he sprayed his neighbors orchard at the right time, leaving his own orchard for a later job. It rained so he could not do his own orchard when it should have been sprayed. But he won't do so again, for his neighbor had a fine crop, while he did not have any.

Fruit growing is one perpetual picnic. It is "up guards and at them" fifteen months out of twelve, although we do not have to fight borers in apple, but it is worth it for it pays in dollars as well as in the satisfaction there is in handling a crop of nice fruit.

Apple packing is the most serious question we have in the fruit business to-day and dealers are the worst sinners and are more to blame for the poor apples packed than the farmer. We are packing No. 1 "Fancy" 2 1-3 in. up and No. 2—2¼ to 2½, both grades faced with good apples of grade in the barrels with the rest of the apples, the same from face to the headed end, corrugated caps are used in both ends, a padded head is used to press the apples down first, then the head is put in. The best press we have seen is the Davis platform press with a large heavy iron ring nearly the size of the head to bring the pressure on the head where needed, instead of the center. This ring is an idea we have worked out ourselves and proves very satisfactory.

Up to the present time we have put our apples in storage as soon as they can be packed with the packers sorting as fast as picked. All the drops and culls are drawn to the evaporator, keeping the orchard cleaned up as we go.

At the evaporator apple prices are very satisfactory, 65 cents per 100 pounds for all that are on the ground and the culls. We expect to have a cold storage on our own farm and draw the apples to the storage, and if we are in a hurry the apples will not be sorted until they are all picked. The apples then will be cooled off and will stop ripening. Will not ripen a bit from the time they are picked until they get into storage.

Prof. Hedrick. Three years ago last spring we set out 24 Baldwins, 24 Bartlett pears, 24 Elberta peaches, 24 Lombard plums and 24 cherries. Twelve we pruned as we had been doing in the past, thinning out the branches to form the frame work of the trees, cutting the remainder back to stubs. Is that the way you do it here, Mr. President?

Mr. Eldon. Many of them do, probably not quite so short.

Prof. Hedrick. Perhaps that is a little shorter than the average. We cut out all the branches that we did not want.

Member. What age trees?

Prof. Hedrick. Two year old trees. The other dozen we cut out the branches we did not want but did not cut them back. These trees were set out a little late in the season. To my great surprise, the trees that were not cut back, in every instance, grew. We did not lose a tree. Of the trees cut back we lost one-half. In the three years that have elapsed since then, the trees that were not cut back to the stubs have made the best growth. Over the old method of cutting back when the trees were set out and then pruning very severely, I am sure that we have made that great gain of strengthening the tree by not cutting back but simply thinning out the branches. All of you who have worked about fruit trees know that the largest and best formed buds are on the ends of the branches. We are trying the experiment of doing no pruning whatever, except to cut out branches that cross and branches that spring from the body that are not wanted. We are not cutting back any from the branches that we want saved, hoping to get a somewhat better formed tree. So much depends upon the conditions and so much upon your idea of a tree, that I am not writing down any arbitrary rule.

Member. Do you not think if you stimulated the growth of the slow growing trees with fertilizer you would get a quicker lot of fruit?

Prof. Hedrick. Well, it is possible.

Member. The untrimmed tree is higher up in the air in two or three years than the one cut back severely, but not so stocky.

Prof. Hedrick. When you begin pruning young trees you have to keep at it.

Member. Did you ever try cutting them back and cultivating a good growth the first year and never pruning any more?

Prof. Hedrick. I have not seen that done. I think we would have too many branches without cutting back.

Member. Did you cut the peach trees back?

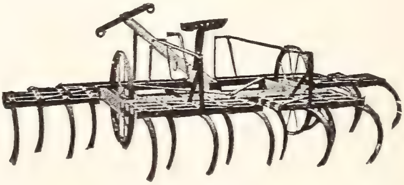
Prof. Hedrick. We cut those back to whips, and curiously enough it happened to be one of those seasons in which the trees refused to throw out buds from whips. Some of our peach men are going to set their peach trees the same as we do the apples, without any pruning whatever.

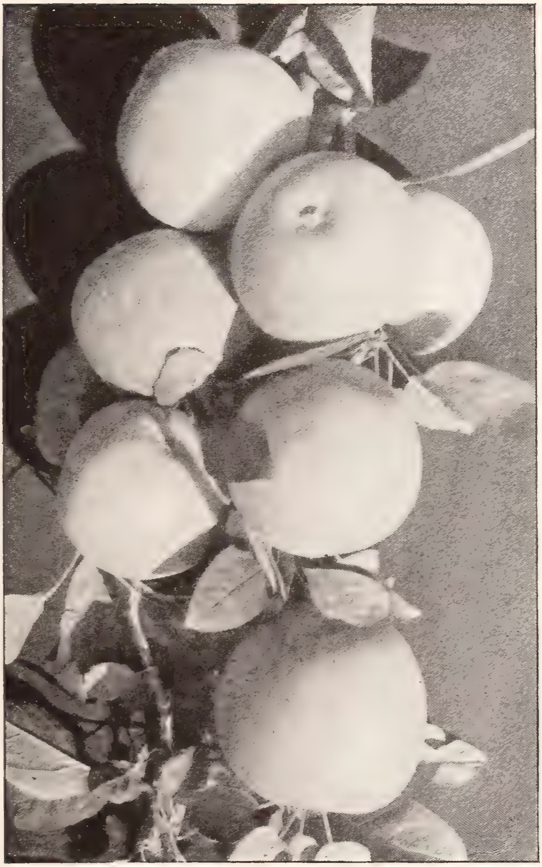
Dr. Stewart. I wonder if we are justified in saying that winter pruning stimulates growth when even in winter we are cutting off those most vigorous buds that you refer to, and I have noticed that growers in England find that all pruning, regardless of season, tends to reduce growth and fruiting, so that my question here is whether or not we are really certain that winter pruning stimulates growth.

Prof. Hedrick. I do not cut off any summer or winter unless the limbs cross then they have to come off.

Dr. Stewart. Personally, I do not believe that winter pruning stimulates growth.

Prof. Hedrick. Well, you do not and I do, that is all there is of it.





A CLUSTER OF ADAMS COUNTY GROWN "WINTER BANANA," (every specimen perfect.)

TILLAGE VS. SOD-MULCH.

DR. U. P. HEDRICK, *Horticulturist, Geneva, New York.*

Mr. President, Ladies and Gentlemen: Commercial fruit growing is a comparatively new development in America. The first settlers of the new world brought seeds of fruits from the old world, for it was impossible, with their slow sailing vessels, to bring grafts or the trees themselves. All of the old orchards came from seeds. The first great impetus to American fruit growing came just after the Revolutionary War, when a great number of men in different parts of America became interested in introducing new fruits in America. They shipped to the old world the trees, flowers and plants that were found growing wild in this country, and brought back varieties of the different European fruits. Horticulture had its beginning at that time. Steam navigation gave another impetus. Before that time trees and fruits could be carried over the ocean only with the greatest difficulty. With the advent of steam navigation these difficulties were removed and many varieties were introduced into America. At the same time the codling moth, apple scab, wooly aphis and other pests which before that time could not be carried across the ocean, were introduced.

The third and chief impetus came after the Civil War. It came with the better transportation facilities whereby fruits could be transported from place to place. Until that time fruit had been carried from the producer to the consumer only by horses, but now railroads and steamboats came into use. Later developments have been the use of refrigerator cars, cold storage plants and means of evaporating and canning fruits.

In the old days the fruits were wholly an adjunct to the farm. The trees were planted near the house and along lanes and fences, and in sod, and the orchards were pastured. The trees received comparatively little care. There was but little money to be made from fruit growing, but with the development of commercial fruit interest it was found necessary to change, and men began to cultivate their orchards. It was found that the trees responded to good care. Fifteen or twenty years ago practically all the Experiment Stations were united in the belief that orchards were improved by cultivation and tillage. There were some exceptions where orchards were planted on hillsides or wet land. Some of these exceptions were so remarkable that much attention was called to them. One or two of our agricultural papers in particular, began to cite these exceptional cases as best for all. This led to a controversy as to the merits of sod and tillage. Our Experiment Station, at Geneva, N. Y., felt that it was necessary to try the two methods side by side. I want now to give you an account in some detail of one of these experiments.

My subject implies a controversy. The disputed question is, Will an apple orchard thrive and fruit better under tillage or in sod with the grass used as a mulch? The Geneva Experiment Station is conducting two experiments to settle this question. This paper is largely a report on one of these trials of the two methods of orchard management, the other not having been carried far enough to warrant a report. In a controversy of any kind terms must be defined, and to properly understand an experiment the conditions under which it is undertaken must be considered and I hasten to these tasks.

Is it necessary to define tillage? The definition is short and clear. To till is to plow, cultivate or to hoe the soil. Tillage is an humble word with its flavor of soil and its suggestiveness of sweating toil but it is an old word and should be an honored one. It has rendered mankind untold and untellable service; it is practiced wherever there is agriculture in the world and nearly all of the plants which minister to the needs of human kind have been improved by tillage. To plow, cultivate, or hoe, to turn and stir the soil, and so improve the crop, or so improve the soil, these simple operations were the beginnings of agriculture and the beginnings of civilization and they have been the chief tasks of all civilized peoples. Tillage is so universal, and is so essential a part of agriculture that those who oppose it for any domesticated plant should look well to its origin, to its history and to its present place in agriculture before charging it with evil.

There are two words to define in the compound word sod-mulch. Sod is soil made compact and held together by the matted roots of living grass. A mulch is an organic material placed about trees to prevent evaporation and to furnish humus. The sod-mulch advocates divide into several sects in their manner of making use of sod and mulch. One sect keeps sheep on the sod, another pigs, and still another says the grass is not sufficient and must be supplemented with straw or manure.

We can understand the experiment to be discussed better if we take a brief glance at the philosophy of tillage and that of sod-mulch. The objects of tillage are so well set forth by one of the leading living authorities on the subject, Professor F. H. King, that I give them without a change of a single word.

" (1) To secure a thorough surface uniformity of the field, so that an equally vigorous growth may take place over the entire area.

" (2) To develop and maintain a large effective depth of soil, so that there shall be ample living room, an extensive feeding surface and large storage capacity for moisture and available plant-food materials.

" (3) To increase the humus of the soil through a deep and extensive incorporation of organic matter so that there may be a strong growth of soil micro-organisms and the maintenance of a high content of water-soluble plant-food materials.

" (4) To improve the tilth and maintain the best structural condition in the soil, so that the roots of the crop and the soil organism may spread readily and widely to place themselves in the closest contact with the largest amount of food materials.

" (5) To control the amount, to regulate the movement, and to determine the availability of soil-moisture, so that there shall never be an excess or deficiency of this indispensible carrier of food materials and through the plant.

" (6) To determine the amount, movement and availability of the water-soluble plant-food materials present in the soil, so that growth may be both rapid, normal and continuous to the end of the season.

" (7) To convert the entire root zone of the soil into a commodious, sanitary living and feeding place, perfectly adapted to the needs of the roots of the crop and to the soil organisms,—adequately drained, perfectly ventilated and sufficiently warm.

" (8) To reduce the waste of plant-food materials through the destruction of weeds and the prevention of their growth, through prevention of surface washing and drifting by winds."

It is impossible by any other means than tillage to obtain for the apple the conditions enumerated above; soil uniformity; soil depth or a commodious living room; an increase of humus; improved physical condition of the soil; conservation and regulation of moisture; greater availability of plant food; a sanitary living place, clean, drained, ventilated and sufficiently warm; and the destruction of weeds. Are not these objects worth striving for with any cultivated plant?

I am fortunate, too, in being able to give the philosophy of the sod-mulch and in the words of Mr. Grant Hitchings, who, as all know has been one of the chief advocates of it. Mr. Hitchings says:

" This system gives one practically the whole Spring and Summer to grow and market other crops, while the orchard is growing of its own accord a supply of vegetable matter for humus that all authorities agree is so necessary for proper soil maintenance. This means that you can do a good business without extra help, growing strawberries, green peas, early potatoes, etc., and have the money for the fruit in the fall to swell your bank account instead of paying it out for fertilizers and cultivation. Other advantages are that you can drive through your orchard to spray better on sod than on cultivated soil, as the latter sometimes gets muddy, and also washes badly on rolling ground. You can allow your apples to mature fully on the trees, for if they should fall on the grassy mulch nine-tenths of them would be marketable. By making repeated gatherings the yield will be largely increased and quality improved. With the mulch method you accumulate humus in your soil; with clean cultivation you burn it out or exhaust it."

We are now ready for direct evidence as to the relative values of tillage and sod-mulch for the apple. How do the systems of management pan out in a commercial orchard? The orchard in which the Geneva Station for five years tried the two methods is located on the farm of Mr. W. D. Auchter, at South Greece, New York. The orchard consists of ten acres of Baldwin trees thirty years old, five acres tilled, five acres in sod. The soil is a medium heavy clay loam, rich, and containing enough gravel to make it porous. It was selected as typical of the average orchard soil of Western New York. The experiment being carried on is a broader one than a simple trial of tillage and sod-mulch. The experimenters hope to add something to what is now known about the food and drink of trees—how trees take them in, make use of them, and with what effects; what influence soil temperature and soil ventilation have on the development and function of tree roots; and among still other problems, what the relationships between grass and the apple may be.

It should be said too, that the experiment is to run ten years at least and that the results now given cover but half the minimum period and are therefore in some respects inconclusive and superficial. For instance, the discussion now centers around the yield of fruit. While of course the crop is the ultimate criterion of orchard treatment yet the effect upon the trees as indicated by the leaf, wood and root development is quite as important an index of the value of tree treatment as the crop of fruit.

The care of the two plots in the Auchter orchard has been as follows: The tilled plot is plowed in the spring and cultivated from four to six times ending the cultivation about August first, at which time a cover crop of barley, oats or clover is sown. On the sod-mulch plots, the grass is cut once or twice during the season and allowed to lie where cut and decay into a mulch. The grass crop has usually been large, but last year it was enormous, thick and tall, standing to the top of the fore wheels of a buggy and no one could say that it was ever insufficient for a good mulch. In all other details of care the treatment has been the same in the two plots.

The ultimate criterion of the relative merits of the management to which an orchard is subjected is the crops of fruit obtained. It is important, however, that trees should grow well and for the measure of vigor there are several characters of the trees available; as the leaf area on the tree, the length of new wood formed; the number of new shoots and the color of leaf and wood. The properties of the fruit, as size, color, time of maturity, keeping qualities and flavor must be noted. We come now to a discussion of these criteria.

The effects of the two methods of management on yield of fruit are shown by the following figures:

	Bbls. sod	Bbls. tillage
1904,	615.1	591.9
1905,	233.	278.9
1906,	210.3	531.1
1907,	275.3	424.3
1908,	325.3	722.5

Average yield per acre on the plots for the five years: sod, 72.9 barrels; tillage, 109.2 barrels; difference in favor of tillage per acre, 36.3 barrels. These results scarcely need comment. For an average of five years the tilled plot shows an increase of a little over one-fourth above the sod-mulch plot. The figures first read show that each succeeding year the difference becomes greater, indicating a continuous loss of vigor in the sod-mulch trees.

One of the chief advantages of the sod-mulch method, as put forth by its promulgators is, that it is a much less expensive method of caring for an orchard. The average expense per acre of the two methods of management for five years was $17.92 for sod; and $24.47 for tillage, a difference of $6.55 in favor of the sod. It is true that the outgo has been greater for the tilled plot but the income has been greater. The cost of production has been materially less for the tilled trees and that is the main point in the whole discussion. A cheap and easy way of growing apples is not necessarily the most renumerative way.

Leaving the yield of fruit for a brief consideration of the effects of the two treatments on tree characters we can mention first the leaf area. Measurements of leaf area were not made but the merest glance through the orchard would show that there were more and larger leaves on the tilled plot than on the sod-mulch plot. The experienced orchardist knows that sparsity of foliage and smallness of leaf can indicate but one thing, ill-health.

So, too, there was something amiss with the color of the leaves. It did not need a trained eye to detect the difference in color of foliage in the two plots. The dark and rich green of the tilled trees could be noted a half mile from the orchard indicating an abundance of food and moisture and the heyday of health, while from the same distance it could be seen that the foliage of the sod-mulch trees was pale and sickly. Of all the signs of superiority of the tilled trees the color of the foliage spoke most eloquently and more than one man of the hundreds who visited the orchard was heard to say as his eyes lighted on the contrasting colors of the sick and of the well trees "that satisfies me." The absence in color in the leaves of the sod-mulch trees was due to a lack of chlorophyl or leaf-green. Chlorophyl is essential to the assimilation of plant-food and when it is lacking the trees become starved and stunted. The leaves on the sod-mulch trees assumed their autumnal tints a week or ten days earlier than those on the tilled trees and the foliage dropped that much earlier, thus seriously cutting short the growing season of the grassed trees and thereby impairing their future vitality.

The new wood produced by the grassed trees tells a similar tale of injury. It was not half that produced on the tilled trees; the twigs were not plump and well filled out; there were fewer new shoots; and the wood of the mulched trees lacked the clear, bright, rich brownish tint of health so that in mid-winter one could pick out mulched trees and tilled trees by the color of the wood.

As to color there is no question but that the fruit from the sod-mulch plot is much more highly colored than that from the tilled plot. This difference varies with the season. Mulched fruit ripens from a week to two weeks earlier than tilled fruit. If the variety and the season are such that the tilled fruit can remain on the trees some days after the mulched fruit must be picked the difference in color is much less. The lighter color of the tilled fruit is readily and clearly explained. The coloring matter in the skin of the apple like that in the leaves, consists of chlorophyl or leaf-green. The coloring of ripening fruit is due to the changing of the chlorophyl of the skin into the colored substances of autumnal tints. Therefore since the sod fruit ripens earlier it colors earlier and in most seasons better.

The abnormally high color of the sod fruit in this orchard is one of the most marked signs of the deleterious effect of the sod on the trees. Every man of experience has observed that when a tree is starved, stunted, girdled, or injured, its foliage and its fruit take on high color. Radiant color in fruit or leaf is often the hectic flush of a diseased patient. The bright color of the fruit of the sod-mulched trees may be purchased at the expense of the vigor and the health of the tree.

A Well Tilled Orchard.

The latter ripening period of the fruit on the tilled plot would be a defect with some varieties and in some localities but in general in New York late ripening is an advantage.

Fruit from both plots for the five years has been kept in cold storage to test the relative keeping qualities. This work has been in charge of Mr. G. H. Powell, the cold storage expert of the United States Department of Agriculture, who writes me in brief: "There appears to have been little practical difference in keeping quality between fruit from sod land and fruit picked a few days later from the tilled land."

There is but little difference in the quality of the fruit when specimens can be had at the same degree of maturity. But the tissues of the sod-mulch fruit begin to break down so quickly after harvesting that at any time after this period the tilled fruit is better in quality. This has been true in all of the five seasons, a fact affirmed by repeated testing by those in charge of the experiment and attested by many who have seen the fruit at the Geneva Station, at horticultural meetings and at institutes. The more pleasing color of the sod-mulch fruit leads many to think it is of higher quality but it requires only a taste to convince to the contrary.

In considering the causes of the differences noted between the two systems of management we can do little more than state the hypotheses which seem to account for the results. The experiment is by no means concluded and definite reasons cannot be advanced until all the proof is in. Yet it seems to me I am warranted in offering the following hypotheses:

First. Plant food is more available in the tilled plot than in the sod plot. That there is an abundance of the plant food necessary for the welfare of the trees and the production of crops in both plots is certain. For the trees in the tilled plots showed in all respects, good feeding, and such trees in the sod-mulch plots as could get any considerable portion of their roots in soil where there were no grass roots, likewise seemed to be well fed. Moreover, two of the chief elements of plant food, potash and phosphoric acid, were added to a part of the trees in each plot for three successive seasons and without appreciable results in either case. It is evident that there is plenty of food in the sod land but for some reason it is not available to the apple trees. The trees are starving in a land of plenty.

Second. The sod-mulch does not conserve moisture as well as tillage. The chief study in the Auchter orchard for the summer of 1907 was that of the water content of the soil in the two plots. One hundred twenty-eight samples of soil were taken at different times during the summer and under conditions safe-guarded in every way possible to determine accurately the amount of moisture in the soil. The analyses showed, approximately, that the water content in the tilled soil during the past summer, was twice as great as in the sod plot, thereby substantiating what has long been claimed that tillage is a better means of conserving moisture than mulching.

Trees must have water. If an apple tree bears ten barrels of fruit, there are about eight and one-half barrels of water in the tree's output. In a full grown apple tree it is estimated that the total leaf area is about 1,000,000 square inches. Mr. F. C. Stewart of the Geneva Station has counted the stomata or pores on a square inch of the apple leaf and finds that a fair average is about 150,000 per square inch. Or for the leaf area of the whole tree, 150,000,000,000 pores. Now to supply the demands of its ten barrels of apple children while these 150,000,000,000 pores are constantly giving moisture is enough to drive a tree to drink and the apple tree becomes a hard drinker. When in the heat and drought of summer, the apple tree is compelled to share its scant supply of water with the thirsty horde of hangers-on found in an orchard sod the trees must suffer. Still further, a diminished water supply entails a cutting off of the food supply. Plant food enters the tree as a solution and an apple tree suffering from lack of water as a necessary consequence suffers from a lack of food. A thirsty plant is a hungry plant.

Third. The sod-mulch soil is less well aerated. In the experiments we are carrying on I have not attempted to secure evidence on this point. It is obvious that sod interferes with the air supply in the ground beneath it and it is not hard to believe that such interference would hinder the proper development and prevent the proper work of roots. The muffler of mulch which forms a part of this system of orchard management would of course intensify the deleterious effects of the sod in the above respect.

Fourth. The soil temperature is lower in the sod-mulch plots than in the tilled plots. It is possible that the harmful action of grass on trees may be accounted for in part by the influence of the sod on the temperature of the soil. During the summer of 1907 the soil temperatures were taken in the tilled and mulched plots twice a day for 41 days at the depth of six and twelve inches and under as nearly comparable conditions as circumstances would permit. At both depths the difference was in favor of the tilled plot. At six inches the difference was slight, being only one-third of a degree but for the greater depth, twelve inches, the average in favor of the tilled plot was 1¾ degrees. It is not an assumption to say that the higher temperature is most favorable to the growth of the apple tree, for plant physiologists, soil physicists and bacteriologists agree that an increase in soil temperature is favorable to plant growth. As one of them puts it, "The soil is a great factory that has its production vastly increased as the temperature rises."

Fifth. There are probably differences in the biological or "germ life" activities taking place in the soil. This is a matter upon which I am not qualified to speak with certainty. But I know that the men who are studying soils find that there are various kinds of micro-organisms inhabiting the soil which have much to do with the proper functioning of the roots that grow therein. The soil is teeming with countless millions of living organisms which bring about necessary changes of one kind and another in that soil; without them higher vegetation would not grow. Now the activities of these beneficient organisms are dependent on soil conditions and King tells us, in the quotation given above, that tillage induces a strong growth of soil micro-organisms; that it improves tilth so that soil organisms may spread readily and widely; and that it converts the root zone into a commodious and sanitary living-place for the soil organisms."

Sixth. The grass may have a toxic or poisonous effect on apple trees. At the Fifthieth Annual Meeting of the Western New York Horticultural Society the speaker gave an account of a series of pot experiments which seemed to show that grass roots in some way poisoned peach trees growing. The United States Department of Agriculture has published a number of observations and experiments to show that different plants growing in the same soil may poison each other.

I am able to give also the results of a most excellent series of experiments planned and carried out on the Woburn Experimental Farm in England. These experiments were planned to show the effects of growing trees in grass, the latter to be used as a mulch. The following gives the gist of the results of the experiments in question:

"As to the general effect produced by grass on young apple trees, the results of the last few years have brought forward nothing which can in any way modify our previous conclusions as to the intensely deleterious nature of this effect, and we can only repeat that no ordinary form of ill treatment—including even the combination of bad planting, growth of weds and total neglect—is so harmful to the trees as growing grass round them. * * * The evidence which we shall bring forward will, we believe, be sufficient to dispose of the views that the grass effect is due to the interference with either the food supply, the water supply or the air supply of the tree, and that it must in all probability be attributed to the action of some product, direct or indirect, of grass growth which exercises an actively poisonous effect on the roots of the tree." I do not put forth the statement that grass poisons the apple as one having been proved but I say that it may be so.

In conclusion you are warned that particular cases do not warrant general conclusions. The Auchter experiment is in many respects a particular case and the apple grower must bear in mind that under other conditions, his own perhaps, the trees might have behaved very differently. The Auchter orchard was selected as being typical of Western New York conditions and the results obtained may therefore be regarded as especially applicable to this region. But there are peculiarities of soil and location which might change them even in Western New York, and no doubt they would be more or less changed in Pennsylvania. It is a simple matter for an orchardist to plow up a part of a sodded orchard and cultivate it for a few years: or as easy for one who has a tilled orchard to lay a part of it down to grass, cutting the grass as a mulch, and in a few years he can see what happens. We want more experimenters among fruit growers and these are good experiments to try when a man becomes dissatisfied with the crops of apples he is getting.

The opportunity of giving another warning can not be lost. The sod-mulch method is heralded as the cheap-and-easy method. But some men can not stand cheap-and-easy methods. If they begin by applying it to tillage they are likely to look for a cheap-and-easy way of planting, the Stringfellow way for instance, a cheap-and-easy way of pruning and a cheap-and-easy way of spraying Some will disembarass themselves with the necessity of taking care of their trees at all and in the end will wind up as ornery, no-account apple growers. I do not mean to say that all will but some of them will. You remember no doubt in Pilgrim's Progress how Bunyan's characters had their natural associates. Thus the young lady whose name was Dull chose as her companions, Simple, Sloth, Linger-after-Lust, Slow-pace, No-heart and Sleepy-head. Cheap-and-easy has his natural associates and they are a bad lot. Take care how you cultivate their acquaintance. Better keep them under a sod-mulch.

In chemistry, physics, astronomy and all of the exact sciences the workers constitute a jury of keen, trained men before which new doctrines can be tried. The jury is always sitting and false doctrine is quickly weeded out. Agriculture has no such jury. Its workers are scattered; many are apathetic; they differ in training and in degree of intelligence; and they speak many languages. There can, therefore, be no suitable jury to try new doctrine, and there are no recognized authorities to approve or disapprove of them. It comes about, therefore, that false and erroneous doctrines often grow unheeded and choke out the true and the useful. Agriculture needs now and ever to be defended against false doctrine. I am venturing to play the part of a defender to-day and if I have gone far in defense of tillage and in condemnation of sod-mulch it is because there is need.

C. J. Tyson. Has there been any possibility of advantage of cover crops?

Mr. Hedrick. The tilled plot of the orchard has always been well supplied with nitrogen through cover crops plowed under. The sodded trees have always responded to applications of Nitrate of Soda.

Mr. Allis. Have you any figures showing the increased income from that orchard after it got on its feet from cultivation?

Mr. Hedrick. I have the figures that were published in our bulletin. For every $100 we have taken from the sod plot, we have taken $150 from the tilled plot. I think I may say that during the time this experiment has been running in western New York there has been a tremendous increase in number of tilled orchards. There are, of course, a good many neglected orchards now in sod, but more and more the growers of this fruit, as with other fruits, are coming to till their trees as they till their corn or any other crop. I believe that Mr. Allis will agree with me that tillage is almost the invariable rule in western New York.

C. J. Tyson. I think that this subject was suggested here for the reason that we are not by any means of one mind on the question of sod and tillage, and simply for the sake of bringing out the other side, I would like to ask your opinion of this proposition: Whether the expenditure of the difference in the cost of handling the sod and the tillage in manure, mulch, fertilizer or sod, might not bring as good results as the tilled method?

Prof. Hedrick. It won't bring it in New York. We have tried that very thing. We have used Nitrate of Soda in excess and yet we can't bring the trees up any way near the capacity of those that are tilled. I have seen the two methods carried on so long, both in eastern and western New York, and have worked so much with these kinds of tillage with trees, that it seems to me almost certain that where tillage can be given it is the better of the two methods.

Member. Do oats and barley supply nitrogen?

Prof. Hedrick. Oats and barley do not supply Nitrogen.

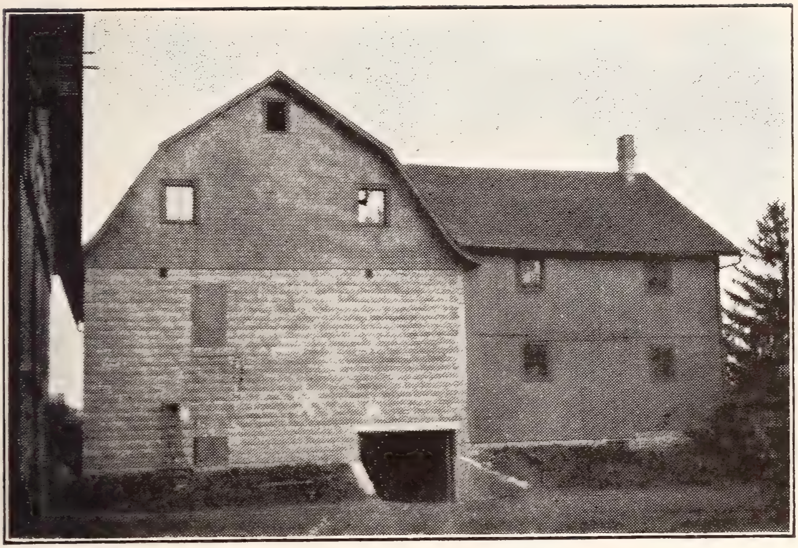
R. M. Eldon. If land is moderately steep or rolling, how would you alternate tilling it and leaving it in sod?

Prof Hedrick. That can be done well, especially if you use clover as sod. Bluegrass would not do so well, but to alternate clover with tillage is a very good plan on land that is too steep to till every year. The addition of organic matter in the shape of straw or hay is absolutely impossible in New York. You must grow on the land the mulch you are going to place under the trees. If you can buy straw at a reasonable rate, to cover the ground, it will far better take the place of tillage than the sod-mulch.

Member. Have the eight year old trees in the Hitchings orchard borne any fruit?

Prof. Hedrick. No. In the last two years we have had blossoms and ought to have had crops of fruit, but both years the blossoms have been killed with frost, which accounts for our not having had a crop.

One Section of Adams County Fruit Which Won Blue Ribbons at Recent Fruit Show in Pittsburg—York, Stayman and Grimes.



An Ohio Cold Storage House.

COLD STORAGE A NECESSITY.

Mr. Clark Allis, *Medina, N. Y., Commercial Orchardist* (500 *acres in apple*), *and President New York Fruit Growers' Association.*

Mr. President, Ladies and Gentlemen: The reason I have been studying lately on the storage problem is because the buyer seems to have a corner on the storage question, with us, and wants a large share of the profit. What I say may not be right or to the point, but it is as I have found it. I saw a clipping in a paper this week in which the opportunity is so great that I am not sure but some of our fruit growers had not better go into this instead of fruit growing.

Millions in It.

A brilliant plan for getting rich is being worked out by an enthusiastic promoter. Only the chance to buy stock in it ("telegraph your order!") remains. The company is to operate a large cat ranch near Oakland, California. To start with, the promoter will collect about 1,000,000 cats. Each cat will average twelve kittens a year. The skins will run from 10 cents each for the white ones to 75 cents for the pure black. This will give 12,000,000 skins a year to sell at an average of 30 cents apiece, making a revenue of about $10,000 a day gross. A man can skin fifty cats per day for $2. It will take one hundred men to operate the ranch, and therefore the net profit will thus be $9,800 per day. The cats will feed on rats and a rat ranch will be started next door. The rats multiply four times as fast as cats. One million rats will give four rats per day for each cat. The rats will feed on the carcasss of the cats from which the skins have been taken, giving each rat a fourth of a cat. The business will be self-supporting and automatic. The cats will eat the rats and the rats will eat the cats, and the company will get the skins. Telegraph your order.

My county "Little Orleans," is less than twenty by twenty-five miles in size, yet it produces more apples than any place the same size in the world, and has thousands of acres of young orchards not producing yet, "but soon." Five shipping points in western New York ship more apples than the entire states of Washington and Oregon.

Our county has seven cold or chemical storage houses with a capacity of 313,000 barrels, which did not begin to take the apples produced this year when a light crop. What will the fruit growers do with their apples when a full crop. This year many of the apples were sent out of the county to be stored, as long as storage could be obtained. When no more storage could be secured, apples were sold at a low price. Some storages that had promised to take growers' apples suddenly gave out the notice, "Storage all taken, no more room." One storage that gave out this report had an agreement with a western buyer not to raise the price of apples and they would both get apples cheap and the western buyer would store 20,000 barrels with this storage. This buyer takes annually from our town for a couple months work enough clear money to buy one of the best farms in the county. It is reported now that the storage was not filled. Many growers could get no storage, so sold out and when they finished drawing could have secured from 50 cents to 75 cents per barrel more for their apples than they sold for earlier. This was a clear loss and could have been saved if there had been storage room.

My storage bill this year is over $2,000 besides the extra cost of drawing apples to the storage and the loss of time waiting to unload when at the storage. During the busy time, an hour or more of waiting to unload is quite a frequent occurrence. Then again the loss on a crop stored in the ordinary storages from the practice of the storage men in always expecting to handle all the apples stored with them. Besides the legitimate 40 cents storage charge, they always want to make a profit as big as possible and some years doubling their money. One time the storage men by accident froze the top three tiers of barrels over my entire block of apples. The damage was not discovered until I took an out-of-town dealer to look at the apples. The storage man said, "Well, I knew your apples were very badly covered with fungus, so I put the temperature down to keep the fungus from spreading." He stopped it. He bought the apples and when he took them out, said they were the best apples in the storage.

For some time, I have had an idea of a farmers' storage, but at the present time all the farmers, who were interested and ready to go in, have been bought off with promises or scared out by a misrepresentation of conditions. When I began to look up the storage proposition, I thought I knew a lot about storage, but it is like making books, "There is no end." In our section there are two kinds of chemical storages used and each advocate is sure his kind of chemical is the only one to use. The ammonia system most generally used has to be pumped at a pressure of 200 to 300 pounds to the square inch, and in case of a leak or break in the pipe has been disastrous to the workmen, and in some instances large damages have been obtained against the owners. The next chemical in popularity is Carbonic acid gas CO2, but it has the disadvantage of requiring a pressure of from 900 to 1300 pounds per square inch. The users of each chemical tell of the dangers of the other kind and the benefits of their particular plants. With each one it requires a double set of machinery complete in every way to guard against a breakdown and heavy losses; for the storage company is liable for the loss by over cooling or loss from lack of cooling, if you can make out a case, but they will always put up the cry of, "poor stuff" and try to prove that the reason why the fruit did not keep was entirely owing to poor quality.

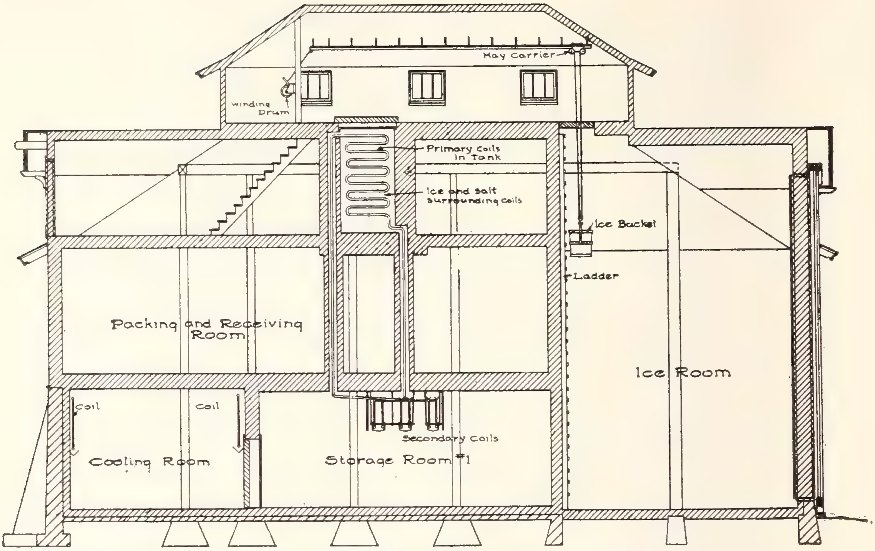
The ammonia storage men claim for their system, that if any escapes by a leak or break, the odor is detected instantly and the defect attended to at once. They also claim a cheaper method than gas to start in with and should a gas system break or leak, there is no way to discover it as the gas is nearly or quite odorless.

Carbonic Acid gas users claim there is less danger to workmen from the gas than from ammonia, and the gas, what little does escape acts as a preservative and keeps fruit much better than the ammonia system.

One of the large storages of 80,000 barrels capacity uses Carbonic acid gas. This storage is a stock company and the company does nothing but straight storage business, never buying fruit. Their stock has averaged net 20 per cent. profits, besides a surplus since it was built, for a period of twelve years. One of the houses using ammonia have paid big dividends since they started, seven or eight years ago, and a retiring partner this year received 200 per cent. for his stock.

The third system of chemical storage for fruit that it adapted to the north, is what is known as the "Gravity Brine System." Mr. G. Harold Powell, formerly with the U. S. Department of Agriculture but now with the Citrus Union of California at a salary for the first year of $10,000, says where natural ice can be secured cheaply, the "Gravity Brine System" is the best and by far the cheapest. Mr. Powell has spent much time studying and investigating cold storage problems for the U. S. Department and is one of the best informed men on that line in the country. Madison Cooper, of Calcium, N. Y., has erected nearly 150 storages of this kind in the United States and Canada. Canada is more kind to her fruit growers than Uncle Sam, and where storage buildings are needed pays 30 per cent. of the cost of new storages.

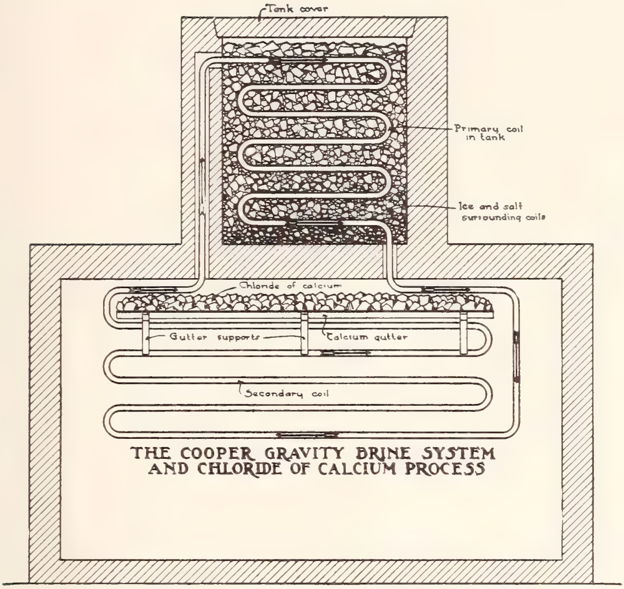
The "Gravity Brine System" is a chemical cold storage the same as the other two, but uses ice and salt with calcium carbide. Usually at the side of a brine storage house, is erected a room for ice well insulated, where ice is kept for use in the storage. No sawdust or other covering is used to keep the ice, depending entirely on the insullation. When operating the storage, ice is run through the ice breaker to an elevator which carries the broken ice to the tanks



LONGITUDINAL SECTION OF A "GRAVITY BRINE SYSTEM" COLD STORAGE HOUSE.
(Courtesy, Madison Cooper Co.)

in the top of the building where it is mixed with salt. This mixture goes into the tanks which have pipes filled with calcium carbide and water. These pipes go through all the storage rooms thus cooling them to the required temperature. There is a complete system of ventilation for all the rooms drawing out the bad air, which contains carbonic acid gas that is thrown off by the fruit and replacing with fresh air. Pears going into storage hot in the summer weather throw off more carbonic acid gas than do the apples, which are put in in cooler weather, and replacing with fresh air. These fans are run on frosty nights in the fall and when cold weather comes can be used at any time, thus saving the cost of ice in operating and giving fresh air to the fruit.

Mr. Hartwell, who ran three cold storages at one time but who is now managing the 80,000 barrel ammonia plant at Brighton, N. Y., came to the conclusion that the old way of storing fruit with no ventilation was bad on the fruit, so at a big expense has put in a complete line of fans, piping, etc., that will change all the air in the rooms in a short time. Carbonic acid gas in any quantity through the lungs is a narcotic poison, while taken through the stomach does not act as a poison, but is refreshing. Mr. Cooper and Mr. Hartwell both claim and seem to be able to prove that carbonic acid gas is detrimental to fruit and should be removed. This idea has not been absolutely settled, but in visiting the different houses, one cannot help but notice better air and freedom from fruit and other odors in rooms where fan circulation is used than in rooms where the same air is kept through the entire season and from year to year. The air is damp and heavy with no life in it.


Tank cover
Primary coil in tank
Ice and salt surrounding coils
Chloride of calcium
Gutter supports
Calcium gutter
Secondary coil
THE COOPER GRAVITY BRINE SYSTEM AND CHLORIDE OF CALCIUM PROCESS

Brine Tank and Coils of a "Gravity Brine System" Cold Storage.

One feels depressed in the room not ventilated besides the unpleasant odor from the damp barrels. Some kinds of wood give off a disagreeable odor and when barrels are made from these kinds of wood, the odor from them for the entire season is almost sickening.

The ammonia and carbonic acid gas systems of storage call for houses of 40,000 or more barrels capacity to keep the cost of operating down to a paying basis. Two complete duplicate systems of machinery must be always ready in case one should break down and two competent skilled engineers must always be on hand, one for day and one for the night shift, and in the Brighton, N. Y., storage three engineers working on an eight-hour shift at $25.00 each per week, and these must be kept the year round for they cannot be picked up when wanted. They also employ two firemen. This makes the operating of storage plants very expensive where machinery is used. The cost, at the present time, of an up-to-date storage house is about $2.00 per barrel for the plants requiring duplicate machinery and about $1.50 per barrel for the "Gravity Brine" houses, thus giving the brine operated houses the advantage in building as well as in operating. Electric power, where a cheap rate can be secured, is the cheapest power, but the new internal combustion engine like the Deisel & Busch using crude petroleum is worth investigating as petroleum is a very cheap material to produce power. The ice and brine plant requires no high priced or expensive machinery in duplicate, but with its systems of fan circulation the outside cold air can be utilized, thus insuring good air and saving ice. The size of the plant does not enter into the problem as with the two first propositions, but natural ice at a low cost seems to be the one necessary item. With the brine system, if one owns it himself, he can sell his fruit at any time and stop storage and insurance charges. If your apples were in some commercial storage, the fixed charges for the season must be paid, no matter when the fruit is disposed of.

I have been working on the storage deal this fall and have decided on a 10,000 barrel gravity brine plant for our own use. Will put the apples in barrels, heading them without pressing, putting them into storage as soon as picked without sorting. If help is scarce, sorting the fruit on rainy days or between kinds, or after the crop is entirely picked. If help is plenty will keep a sorting gang at the storage drawing all the apples there to sort. Should we leave our apples to sort until picking is done, it would benefit the evaporator man by allowing him to evaporate the drops before they decayed and holding the picked culls to the last.

We will have our storage house on our farm between the steam and trolley tracks, with siding from both. Will also have a large evaporator on same siding, thus insuring short hauls for picked and dropped apples.

Storage is absolutely necessary and notwithstanding so much rot published for the last few years in city papers about storages making living more expensive, it tends to equalize the cost of living. Without storage it would either be a feast or a famine, a glut in the market and produce of all kinds selling below cost of production and then a market bare of the same things that had been wasted for the lack of storage facilities. Cold storage is an infant, but a few years old, but he is growing. Mr. Case, of Sodus, one of the best growers in the state said that he lost a lot of apples this year at the last end, the apples just got ripe and dropped off. If he had had a storage to have drawn his unsorted apples, he could have saved his entire crop, sorting them after the apples were all picked.

Mr. Lewis. What is your plan in regard to temperature?

Mr. Allis. I never ran a storage, but think a temperature of from 30 to 32 would be right, or probably to 35.

R. M. Eldon. We would have no difficulty in getting natural ice.

C. J. Tyson. Do you know the quantity of ice needed?

Mr. Allis. Mr Cooper came to see me last week. He said that for a house holding 10,000 barrels, it would require 1,000 tons of ice in a year.

C. J. Tyson. How late would you figure on holding the apples with that quantity of ice?

Mr. Allis. I think that their idea until the following spring, until June. My idea has been for some time that many apples have been nearly ruined in storage. They come out from in the center, while apples kept in a cool cellar, about 40 degrees, are kept in better condition than in the cold storage. I think apples will go to the consumer in better shape from the excessive cold of the cold storage.

Member. Would apples freeze at 32?

Mr. Allis. No, not in a barrel.

R. M. Eldon. During January and February would you contemplate using the natural temperature?

Mr. Allis. With such weather as this I think apples would keep without ice at all.

E. C. Tyson. It would be necessary for you to think of the maxium amount, would it not, as some years you would not use any scarcely?

Mr. Allis. As I understood Mr. Cooper, 1,000 tons was the maximum that would ever be required.

E. C. Tyson. What does he allow for waste between the times of storing the ice and using it next fall?

Mr. Allis. If the house is properly constructed and insulated there will be very little waste. I think Mr. Hedrick has had quite a little experience and can answer some questions that I do not know anything about.

Mr. Hedrick. While I was teaching in the Agricultural College, Michigan, I worked for several years in connection with the college storage house, holding over 6,000 barrels of apples. I can give you any information about running it but cannot give you the figures. The system worked satisfactorily. It cost 50 cents per ton to put up our ice. We had no trouble in keeping it, there was very little waste. Sometimes the ice would be in the house three, four or five years. This small storage plan worked very well indeed. There are, I believe, one or two in the Hudson River district.

Member. Was the storage room insulated with cork?

Mr. Hedrick. It was. There were two thicknesses of cork and two cavities, or air spaces. The cork was only thin, there was no 3-inch cork.

Member. Must ice be taken from the storage room and put somewhere else?

Mr. Hedrick. Yes it must be taken from the storage room, mixed with salt and put in the top. You must understand that you have, in the top of your storage, a system by which you make brine and crushed ice, and a pipe system running through your room which carries brine.

Member. Is this circulation carried on by gravity?

Mr. Hedrick. It is carried on by gravity entirely.

Member. What would be the life of the tanks in regard to salt?

Mr. Hedrick. We have used this house for several years. It is still in use. So far as I know the pipes have never been changed. It is calcium chloride in the pipes, I do not know what the life of the pipes would be. You might have to renew them.

Member. As the pipes run through the tank, I should think that salt would corrode them and very likely would be sharp.

Mr. Allis. I asked Mr. Cooper that same question, and he said that the life of the pipes was several years.

Member. Do you remember the size of those pipes?

Mr. Hedrick. About 1½ inch. They are not expensive pipes.

E. C. Tyson. Is the question of ice a daily process while in operation in hot weather?

Mr. Hedrick. In hot weather it is a daily job to have a man crush the ice and take care of it. At this time of year it is probably a weekly job, taking an hour or two to put the ice in.

Mr. Allis. As I understand it. the elevator runs from the ice house to the upper story where the ice is mixed. There is also another point I had thought of in this system, that the ice storage room would be nearly empty at the time you picked your apples in the fall. You can store your apples in that room until you have to fill it with ice the next winter. I asked Mr. Cooper about that and he said it would work all right. That would give you that extra room.

E. C. Tyson. Do I understand that the temperature is automatic?

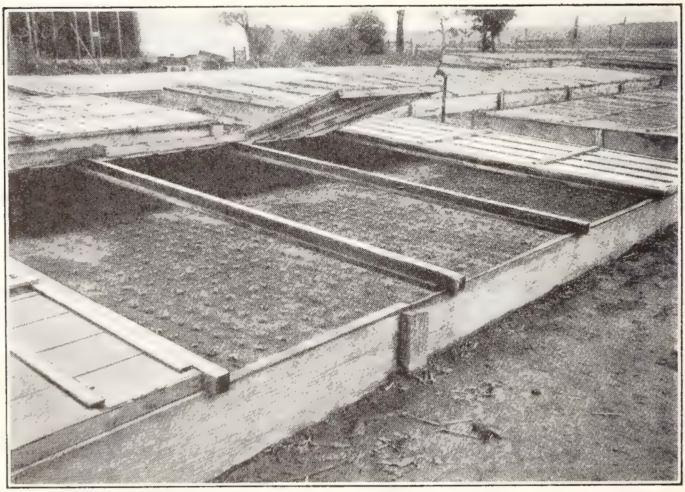
Mr. Hedrick. The temperature is pretty nearly automatic. If you are looking after it closely you can make it automatic. It varies little more than chemical storage.

E. C. Tyson. What attention would be required?

Mr. Hedrick. Putting in more ice and more brine, keeping that more regularly supplied in order to have a lower temperature, and in opening the ventilators and running the fans. It is always an easy matter. And there are also automatic thermometers to help you out.

Member. What runs the fans?

Mr. Hedrick. Electricity. In a plant the size of Mr. Allis' it would almost be necessary to have a small engine or electric power.



Starting Melons in Hotbed.

A Fine York Imperial Apple Tree.

BUSINESS METHODS IN MARKETING APPLES.

W. J. Lewis, *Pittston, Luzerne County, Pa., Commercial Orchardist and President of the Fruit Growers' Association of Luzerne County.*

Mr. President, Ladies and Gentlemen: We up in Luzerne have for sometime recognized the fact that in the Adams County association you had one of the strongest societies in the east. One that was doing more for itself and its members, and one that had been and still is, an important factor in the development of the fruit industry in this section. For that reason I have looked forward with pleasure to the time when I could meet with you. That anticipation of pleasure is now more than fulfilled. I have assurance also that my being here at this time will be a pleasure to you. Lest you might take that feeling for one of conceit I will explain why I have it.

A few weeks ago at our Luzerne County meeting your Mr. C. J. Tyson was with us and gave us two very interesting and instructive addresses. While there he asked me to come to this meeting and address you on the subject which has been assigned to me. I tried to be excused with the plea that I had been so busy the last 15 years trying to learn how to grow and market fruit that I had'nt had time to learn how to tell about it in public, but he said "Oh, they are a good natured bunch down in Adams county and will put up with most anything." So I have risked your everlasting displeasure and will do the best I can.

When I get up to talk in public I am reminded of a story I read a few weeks ago. A young man was to address his first audience. After he had been duly introduced he forgot everything he had intended to say. His mind was entirely a blank. The only thing he could think of at all was a little story he had read in a paper a few days before, so he had to give them that. He said, "Friends great oratory is almost a thing of the past. The kind of oratory that sways men's minds and influences their whole life is almost gone. Cæsar is dead, Abraham Lincoln is dead and I am not feeling very well myself."

I am just a little reluctant to bring up this subject in the presence of you people who have had considerable experience in the growing and marketing of fruit, many of you being much older and having had more experience than I have had, but we have all had different experiences and these things appeal to us in different ways. For this reason I shall hope to call your attention to a few things in marketing as I have seen them, with the hope that it may be of some little value to you. While my subject is the marketing of fruit, what I shall say along this line will apply equally as well to any or all other farm crops.

The advances that have been made along horticultural lines the past few years are simply wonderful. We naturally expect any new industry just starting up to make marked progress, but in horticulture we have one of the oldest industries known, as we presume that ever since the apple was in the garden of Eden more or less fruit has been produced. And now after these thousands of years to start up and make such progress is nothing less than marvelous. The sources from which we may learn how to grow crops are many. We have our United States Department of Agriculture, our several state departments, our agricultural schools, Farmers' Institutes, books, papers and last but not least these associations, but unfortunately, while these tell us how to grow crops, they don't give us much instruction on the marketing of them. Now, that seems to me one of the most important things we have to consider: it is the end of the business from which we get the price to buy the necessities, comforts or luxuries of life as the case may be.

Notwithstanding the wonderful progress that we have made along the line of crop production, we must admit that other industries have better systems of marketing their product than we have. And yet I do not recall the first practice followed in marketing other products that would not apply equally as well to ours.

I do not know of any better way that I can call your attention to a few things I wish to at this time than by a short study of the methods of those engaged in other lines and comparing their ways with ours. Just for the purpose of comparison I am going to try and call your attention to some of the ways and workings of the International Harvester Company. As you all know they are a large corporation with many factories turning out many different implements, and yet they make but one thing in each factory. This might suggest to us the advisability of being a specialist. I think the day of the specialist if not already here is coming very fast. Many arguments might be brought in support of this, but the one having to do with my subject is this: If we are growing but one crop we can produce that in sufficient quantity so that our influence is felt in any market that we care to enter, and to the extent we can make our influence felt, just to that extent can we control prices. This fact might dictate to us as to what market we should go. A market in proportion to the size of our supply.

Another point to which I wish to call your attention is the matter of cost. We, in order to market intelligently must know the exact cost of any product we put upon the market. From what I have seen since I have been in your county I believe you have a better development along horticultural lines than we have in Luzerne, yet if I should ask you how many of you knew the exact cost of any product you ever put upon the market I doubt if one of you could tell me. I hope for your sake that I am wrong about this. It is a principle as old as the hills that in order to trade (and that is what marketing is) intelligently you must know the value of what you are trading in. This matter of cost may look like a big job to you and I will admit that it does require some study and thought to work out a system to properly work out the cost of our different crops, but when you have such system once started it only requires a few minutes each day to keep it in shape. Bear in mind that the International Harvester Company have their own ore-mines and forests from which they take their raw material and their business requires a much more complicated system to know the cost of their product and yet they have it because it is absolutely necessary that they should. I believe it is very possible for us to make a nice little profit on four or five acres of some crop and loose it on a pair of pigs or a dozen chickens or visa versa just because we don't know the cost.

Another thing this company does: At some certain time of the year they take a complete inventory, so that they can tell to the cent whether their operations for the year have been at a profit or loss. What would it be worth to us now as fruit growers if we had done this every year and should do this again on the first day of next January and then set down and figure out just what we had made or lost during the year that is past and then take our cost account and tell just what crops we grew at a profit and which ones at a loss. What a guide to us in our future work.

Another thing they do very extensively is advertising. It was said a year or two ago, in the sale of automobiles for instance, on a $2,000 machine, that absolutely $1,000 of that was spent for advertising and placing the machine on the market. Now I am not saying that it would pay fruit growers to spend so large an amount proportionately as this, but there are many little and cheap ways that we can use to call the attention of the public to the value of the apple as a food. Just last week in conversation with a western apple man he told me that it didn't make any difference where you went or for what purpose in Spokane you heard the apple talked about. Those western fellows are just filled up with it and we can see the result of that kind of advertising in our eastern markets. I heard another good authority say that if fruit growers would advertise and educate as extensively as the breakfast-food people did that there wasn't enough apples grown in the United States to supply the population of Pennsylvania. Bear in mind that their product has no value as a food in comparison with ours.

Another thing it does'nt make any difference whether a mowing machine is sold at home, in South America, Africa or Australia, the identity of the manufacturer and the place of manufacture is never lost sight of. The only place that this doesn't count in is the junk heap where the price has fallen from about $45.00 to $2.00. Friends, there is entirely too much of our product sold as junk. If you are turning out a product that you are ashamed of, let it go as junk, but if what you have for sale is as good as the average stamp your reputation on to it, show the consumer that you are not ashamed of it and you will be surprised what a lot of confidence you can inspire in him and what a price he will pay for it.

As illustrating that and another thought in advertising, we sell a good many of our apples in our local market, and two years ago we thought of putting a shipping tag on each of our baskets. It was not addressed, simply put on the basket. The merchant asked what we put those on for, and we said we wanted the basket back. He said he would keep the baskets for us, but some other fellow might find out where he was getting the apples and compete with him. I told him if I found our baskets sitting out without our tag on them we would quit him. That is advertising and identity.

Another thing that the International Harvester Company does when they have a machine ready to go out they never go out to a fence corner and pick up some old piece of wood to make a case for it. If you wanted to buy that machine and it had an old case on it you would think it was an old machine. They use a nice, new, bright case. It pays them to do it.

I do not know how you people here market your fruit altogether, but in our county I have seen apples as good as the average of these exhibited going to market in boxes that hens had roosted in, in old weather-beaten boxes, and I have seen them in a dog-coop. I do not believe you do any of these things or I would not dare say so much. But to get back to the marketing end of it, we must put up our fruit in a package that is going to add to, rather than detract from its appearance.

Another thing that they do, they rake this country over with a fine-tooth comb, as it were, to get the very best man they can for a salesman. What constitutes a good salesman? In the first place, he should be good-looking; any of us can fill that bill. He ought to be reasonably well dressed; any of us can fill that. He must be a man of fairly even temperament. It does not make any difference what appears, he must not get angry. In other words, he must always be able to turn the bright side of the deal out for the inspection of the public.

For illustration I want to tell you of an incident. A farmer went into a grocery store to sell potatoes. He wanted 80 cents a bushel for them. The groceryman came out and shook hands with him and asked him how things were going out on the farm, and whether he had pretty good crops, and by that time they had reached the office.

The farmer sat down and poured a tale of woe into that man's ear that would have made even Job turn green with envy. The groceryman had troubles enough of his own. The groceryman dispised him because he saw that that man dispised his business. He did not care to do business with him. He said "I will give you 70 cents for your potatoes." The man would not take it.

The next day another man came in and shook hands with the groceryman, and by that time the groceryman had somewhat recovered from the host of the day before, and he asked him the same questions and treated him the same way. They had not been in the office fifteen minutes before the groceryman was ready to turn his business over to that farmer. This farmer had been prosperous the whole year. The fact was that the first man had been the most prosperous of the two but he did not know how to advertise. He sold all the potatoes for 85 cents. Never let the other fellow see how dark your side is; keep good natured and you can sell.

A salesman must have confidence in himself and faith in his product. That implies a whole lot. In the first place, to have confidence in himself he can make his way anywhere and go anywhere. If he thinks he is going to make a sale and get a good price, he is going to do it.

Now in conclusion, there are quite a good many little tricks in marketing that I might call your attention to. I mean there are little ways of keeping your customers good natured. I do not mean dishonestly. To sum up what I have said, we ought to get more actual business into our marketing. We have got the best business on earth. It is worth a good deal more consideration and attention than we give it. In proof of the fact that we have the best business on earth, I would challenge any one of you to name any other business that you are acquainted with that would stand the lack of attention that we give ours, and see if you can think of any business that would stand the methods we use. It may be that you people down here are very much more advanced along these lines than we are.

There has been quite a considerable controversy the last year or two in regard to the per cent. of the consumer's dollar that the fruit grower gets, and the "Rural New Yorker" has it figured down that we get only 35 cents, or less, of the consumer's dollar. I wonder how it would work if we would say that the consumer is paying $3.00 for one dollar's worth of goods. If the consumer was not responsible, it would be up to the growers to make the change. We have got a whole lot the best end of the string, it seems to me. I do feel sorry for the large bulk of consumers. If the conditions are as we see them, the next move is up to them, and any move that is made to remedy that condition must come from the consumer. That is about all I have to say on this subject, and I thank you.

R. M. Eldon. Are you interested in storage?

Mr. Lewis. We are only interested in storage, at the present time, in the natural storage. We have a little storage building of our own, and I am not just prepared to say that that storage would work out on an extensive scale, but by choosing varieties, we keep apples in that storage that we sell all through the fall and winter season, and keep them up to the middle of May and June, with very little loss. Moreover, we have customers who say they will absolutely not buy cold storage apples. Whether the flavor goes out of cold storage apples, I do not know, but they think the apples are not good after being in cold storage.

R. M. Eldon. Do you ship on the cars, or how do you get them to market?

Mr. Lewis. Practically all the apples we grow we grade and the better grade we box, just as you have these boxed here, and those we ship all over the world, and what we call seconds, are fairly good apples, which we sell in local markets, hauling them in bushel baskets, by wagon.

Member. Do you store in bulk?

Mr. Lewis. Yes sir; we store in bulk. There are just a few little things that I might call your attention to. We have our regular customers that we supply. We have six in Wilkes-Barre, four in the city of Pittston, and four in Scranton. Anyone outside of those few we would not sell a bushel at any price.

People get anxious for anything they can't get. After we have marketed to them a little while, a fellow once in a while will get a little independent and when that fellow tells us his request for that day or the next day, it may be 10 bushels. When we go there the next day we only give him six bushels. If we just try to give him one extra one he would fade away, but if we cut him short he gets anxious right away.

Mr. Houck. You speak of having your own storage. Can you keep your apples without using ice? I think that would take the flavor. How do you preserve your apples to keep them?

Mr. Lewis. We have a storage built of concrete 16 feet wide and 80 feet long and 10 feet high. We went into a bank four feet so when the thing was completed we had taken out just enough dirt to cover the top. It can be arched over with concrete or stone or whichever is the cheaper. We ventilate it from the top. In picking, we take our apples just as they are picked. Not over 15 or 20 minutes from the time they are taken from the trees we have them in the storage. The important point in storage is to get them promptly in storage. At picking time we have occasionally a cold day and a cold night, and any day it is colder outside than inside we open ventilators and then close them again. We have it well enough insulated that we can hold it at whatever point we have it.

Mr. Houck. Would it be an advantage to have a mode of forcing cold air underneath and letting the other pair pass out at the top?

Mr. Lewis. If you hold a match up to the chimney you can tell which way the current is.

Member. How many apples will a cave that size hold?

Mr. Lewis. We have this in bins. We grow quite a number of varieties. We pile them 8 feet in bulk. We put in the side bins, the kinds we know we are going to keep the longest. By being very economical in space it will hold 7, 500 bushels.

C. J. Tyson. What do you think of the attitude of the consumer to help himself out by taking fruit direct from the grower? Are they inclined to do it?

Mr. Lewis. The class of people that are doing that are the wealthy class, but the people that I fear are almost at the starving point do not seem to consider that at all. They do not seem to care about it.

W. S. Adams. What are your leading varieties?

Mr. Lewis. That is a hard question to answer. We have 77 varieties in bearing and there are only a few of those that are not profitable. If I were to set another orchard I would not set more than nine.

E. C. Tyson. If you were growing apples with a view of marketing in carloads you would not want so many varieties. Not over nine.

Mr. Lewis. Some people advise two or three.

Member. Have you selected a list of nine that you consider best for your locality?

Mr. Lewis. Yes, nine or ten. I could give you that list for our location, but you know something about our latitude and our soil is a silty loam. It is a little different soil from anything they have ever found in this state. Our altitude is 750 feet. If you will bear those conditions in mind I will give you the list. If we want to start in early we take the Yellow Transparent, then the Red Astrachan for the first general purpose apple. Now, I do not know what your conditions are here as to local markets. I do not know if it is advisable to grow summer apples in carload lots. You come nearer getting a supply of good eating apples in the winter than in the summer. It seems to me that the summer apple is the profitable apple if it is taken right off the tree and sold without any handling and without storage.

Gravenstein,
McIntosh,
Baldwin,
Wealthy,
Smokehouse,
Stark,
Duchess,
Wagner.

They are all good bearers, have good color and all the quality that we can ask of an apple in our section.

W. W. Boyer. The best grade you talk of shipping all over the world, in what package do you ship them, and how do you find the market?

Mr. Lewis. We ship them in barrels and boxes, wrapped. We find the markets partly through fruit shows, advertising in that way. If you were able to go into the remotest corner of the United States and do something just a little bit better than anybody else has ever done it, you could not hide it, the people would get there to find out about it. If you will box apples that are just a little better than the average in the city markets, it is just a question of finding here and there a customer. One customer will tell another, that one will tell another, and in that way you will get your market.

Member. Do you ship direct to the customer? We ship direct to the consumer.

Member. Do you know what your storage cost you?

Mr. Lewis. $1200. We built the storage at picking time, and every two or three weeks an out-of-town commission man came to buy our crop. One came in one day when we were picking and asked if we were ready to sell. We told him we were always ready. He said, "I bought a whole lot around this country for 65 cents but these are just a little better, and if you will keep still I will give you 80 cents." I told him to go with me to where we had a few piled up and show me how many he was going to pick out. When he got there his eyes were quite a little bigger than when he was in the orchard. He said, "I will give you $1.25, but I see that you are not ready to sell." I said "No,' we are not ready to sell." We did a little better than that. We had 4,000 bushels.

A good little storage would be a good thing for you, just to hold as a club over the buyers.

The Stayman Grows Large When Well Cared For.

Williams' Early Red.
A very satisfactory Red Apple for early summer.

THE EASTERN FRUIT GROWERS' ASSOCIATION, ITS PLANS AND PROSPECTS.

Mr. N. T. Frame, *Secretary, Martinsburg, W. Va.*

Mr. President, Ladies and Gentlemen: Down in Berkeley County, West Virginia, we are accustomed ordinarily to say that there are two leading County Horticultural Societies in this part of the country; first the Berkeley County Horticultural Society and second the Adams County Horticultural Society. I shall go home from here and tell my people that we must immediately call a special metting and start a fund to put up a building. I see that we are second to you in Adams County which we cannot afford to be. We are going to have a building.

Personally, I have for a long time wanted to get to Adams county. Now that I am here I assure you that I am very much gratified to see the audience that is here to discuss the subject of marketing. If there were no other impression or information that I could carry away from this meeting I should feel that I had been well repaid for coming over here simply to hear Mr. Lewis' practical talk on marketing problems. He told us a whole lot of things that will do us all good, and I particularly agree with him that in commercial fruit growing even in Adams County and Berkeley County, we ought to have ripe, well developed apples to put on the market in the fall, whereas, at the present time, we are then putting on the markets cull apples that are not fit to eat. When you or I pick up a basket of grapes from a fruit stand and take them home they look fairly good, but when we taste of them find them green, we do not buy any more grapes for some time. Now, the man or woman in New York, or Savannah or New Orleans who attempts eating York Imperial apples in the fall, does not buy any more apples until he or she is forced to do it. We want to have a ripe apple on the market in the fall season even if we sell that apple at cost. We shall be educating the people to use our later apples when they do become ripe.

But this has nothing definite to do with the Eastern Fruit Growers' Association. Two years ago a number of fruit growers from our section went to Washington and appeared before the Committee of Agriculture to further the passage by Congress of a bill giving the Secretary of Agriculture authority to quarantine against infested nursery seedlings. There seemed to be inadequate methods of detecting the imported brown-tail moths. We felt, in our section, that if a nest of brown-tail moth should get scattered we could not afford to spray against it.

When, however, we reached Washington, we found only a handful of fruit growers from two or three sections. We put up an argument before the Agricultural Committee which was admittedly strong, but we could claim before that Committee to represent only a handful from the fruit growing industry. We learned that a number of your people, I think several of you gentlemen from Adams county, had been down to Washington furthering the passage of the so-called LaFean Bill, standardizing packages. We were in favor of the LaFean bill. Your people went down to push the LaFean bill, we to push the Simmon bill. If we had all been there backing both bills, we might have got favorable reports. It, therefore, seemed advisable that some form of interstate organization be effected, and last year at the Hotel Raleigh, Washington, the Eastern Fruit Growers' Association was organized. Many of you have copies of the constitution with the minutes of that meeting last year. In concise terms, the idea of the Eastern Fruit Growers' Association is that the organization is a legitimate lobby in the interest of fruit growing in Virginia, West Virginia, Maryland, Pennsylvania, Delaware and District of Columbia, and to further legislation which will help our fruit growers.

If any matters come up before the Agricultural Committee, the officers of the Eastern Fruit Growers' Association are expected to be advised of that fact and arrange for hearings at which all the fruit growers can be represented. There are certain interstate problems which affect this whole territory that neither your state society nor the Maryland state society, nor the Virginia state society, can alone successfully solve.

The second annual meeting has just been held this week in Washington, and in this connection I would like to beg the pardon of the Adams county society. When we arranged for the Washington meeting I told Mr. Lupton I thought there would be no conflicting dates this week. It was unfortunate that we should have picked out a date that made it impossible for any of your people to be in attendance.

At the meeting at Hotel Raleigh on Tuesday and Wednesday of this week, the matters discussed were as follows: It was decided that in the following line of work laid down we might more profitably confine the membership to the five states, Virginia, West Virginia, Maryland, Pennsylvania and Delaware, taking in, of course, any people from the District of Columbia. We did not feel that we necessarily would be antagonistic to New York or to Georgia and states farther south, although matters might come up where there would be a conflict of interest; but we felt that we could accomplish more by limiting the membership to these states. You will notice by the constitution, that the Eastern Fruit Growers' Association is open to membership to commercial fruit growers or men and women engaged in scientific research work relating thereto in the five states mentioned. The membership fee is $1.00; for societies, $5.00. It is to be hoped that Adams county will join as a society and a number of you as individuals.

What shall the standard package law be? You people are backing a proposed LaFean Bill standardizing a 28½ inch barrel stave. We were fighting for just such a barrel. In Virginia the state law makes standard a barrel one inch shorter with a 27½ inch stave. If any effective legislation on standard packages is to be passed by Congress, the fruit growers who are vitally affected must go before Congress united and demand the same standard. If you people from Pennsylvania, and we from West Virginia and Maryland go down before the Agricultural Committee in favor of a 28½ inch barrel, but the strong Virginia Society send a big delegation up there claiming that such a standard is unjust, and there should be a 27½ inch barrel, it is very likely that the bill will never come out of the Committee, which fact proves the necessity of an organization like the Eastern Fruit Growers' Association. The result of the discussion was that a committee of five, one from each of the five states, was appointed. This committee is expected to canvass the sentiment of their various states. I hope we can persuade the Virginia people that they are wrong. If we do persuade them then the fruit growers will go before congress united in effecting legislation along that line.

I have here a table of rates on which Hagerstown is taken as a basis for this section. On the shipments going to points like New Orleans or Jacksonville, the freight rates from all stations are just the same as the Hagerstown rates. Now the point is this: The price of apples through this whole York Imperial belt depends largely upon the lowest price in any one section. If the dealer can buy York Imperial apples in Winchester or Martinsburg for $2.50 he will not come here and buy yours at $2.75. This York Imperial belt is well defined, and my experience is that the lowest market price, packing and other things considered, governs the territory. The rate from Rochester to Memphis is thirty-five cents per hundred, and from Hagerstown to Memphis, thirty-five cents per hundred. Your York Imperial may not go so exclusively to the southern markets as ours do. A great many of your apples, nevertheless, go south. A buyer comes in here with the idea of buying 20,000 barrels of apples. He finds, however, upon investigation that he can buy 20,000 barrels of New York apples and get them into southern markets as cheap as or cheaper than he can get ours in. Now as a matter of justice, we believe we are entitled to a differential as we are several hundred miles nearer to this market. At this meeting in Washington on Wednesday, the members pledged a fund of $2,000.00 to hire an attorney to bring this matter before the Interstate Commerce Commission. We feel that you people will be willing to co-operate and bear your share of the burden.

Prof. Symons of the Maryland Agricultural College, read a report on Simmons Bill, which will have to be reintroduced this season giving the right to quarantine against infested nursery seedlings.

Prof. Waite together with Dr. Haywood and Prof. Quaintance, all of whom are members of the Insecticide Board explained something of the workings of that Board and the present law regarding spray materials. The law is broad enough so that any insecticide and fungicide which bears evidence of having been adulterated can be confiscated and the manufacturer prosecuted. But the evidence must be collected by the regular agent of the department. If any of you gentlemen suspicion that you have adulterated spray materials write to the Department at Washington telling why you think they are adulterated, and give the name of the brand and name of the manufacturer, which will give the Department a suggestion, and maybe one of their inspectors will pick up samples of that particular brand in some other sections and if they are found to be adulterated the Department will have evidence on which to prosecute.

The Eastern Fruit Growers' Association felt that apple crop reports should be in terms of barrels rather than in percentages. No one seemed to know what would be a 100 per cent. crop. It is an abstract proposition. Our growers on the other hand are accustomed to estimate in terms of barrels when they place their order for empty barrels with their coopers. We think in terms of barrels and we sell on the basis of barrels The Eastern Fruit Growers' Association, therefore, resolved unanimously to request the Department of Agriculture to work out a more satisfactory method of fruit crop reporting. A suggestion was made that just as the department at one time detailed Prof. Scott to work out the problem of spraying peaches with self boiled lime-sulphur and then send him to fruit growers meetings over the country to teach the growers the result of his experiences so now we would like to have a man detailed from the Bureau of Statistics to study with the owners and shippers and market men the subject of apple crop reporting and to formulate definite blanks and methods. If this specialist could then be sent to the horticultural society meetings so as to educate the growers in attendance upon a uniform method of reporting from all the different sections there would be in the course of a few years many thousands of trained crop reporters using the same standard. This we believe would be a great benefit to the growers.

The Eastern Fruit Growers' Association elected the following officers: As President, Mr. S. L. Lupton, Winchester, Va.; as Vice-President from West Virginia, Mr. C. W. Thatcher, Martinsburg; Vice-President from Maryland, Mr. E. P. Cohill, Hancock; Vice-President from Virginia, Dr. S. S. Guerrant, Callaway; Vice-President from Pennsylvania, Mr. D. N. Minnick, Chambersburg; Vice-President from Delaware, Mr. G. L. Soper, Magnolia; as Treasurer Mr. E. I. Oswald, Chewsville, Md.; as Secretary, Mr. N. T. Frame, Martinsburg, W. Va.; as members of the Executive Committee the five state vice-presidents as named above.

I again extend to the Adams County Society the invitation from the Eastern Fruit Growers' Association to become an affiliated member; and to all of you as individuals the invitation to become members.

I want to read here a paper on marketing the York Imperial apple. This paper was endorsed by the meeting on Wednesday. I was requested to bring this paper before the five state meetings. This paper is entitled "Styles in Fruit" and is relative to some market problems.

Styles in Fruit.

In a recent issue of "Farm and Fireside" edited by our fellow orchardist, Mr. Herbert Quick, of Morgan County, West Virginia, appeared column after column of advertising matter addressed to the farmers and the farmers' wives to convince them of the necessity of dressing in an up-to-date style, filling their homes and barns with up-to-date equipment and going to town in an up-to-date automobile.

Mr. Quick's paper, as I understand, carries twice each month to some half million homes this appeal to country people to send their money to the cities—to the so-called trade and manufacturing centers. Yet large as is the amount of such advertising carried by "Farm and Fireside" it is but a drop in the bucket compared to the whole volume of carefully prepared advertising matter going into the homes of the producers in this country with the purpose and intention of educating them up to the point of being up-to-date, of keeping in style.

This oft repeated and long continued appeal has produced a marked effect in the industrial life of this country. Countless cities profiting in the hundreds of channels of trade opened up by the advertising campaigns of the last twenty-five years have doubled and tripled in population; while the country districts offering only a passive resistance to their exploitation by the cities have in very many cases gone backward.

The cities with the aid of their advertising compaigns have been sending into country homes their patented luxuries and trade-mark necessities at fancy prices; while the country districts have blindly competed with each other in the open market to dispose of their foods, wools and cottons in bulk quantities with no thought to provide "styles" in raw materials and eatables so as to bring back from the cities at fancy prices some of the money sent there for the stylish but high-priced city products which the country people have been persuaded to believe form a necessary part of their every-day living.

As any man knows, who feels it necessary to buy a new derby hat this year, because his old one, perfetly good yet, is this year out of style, the styles in men's hats are controlled not by the consumers, but by the hat trade, from manufacturer to retailer, whose businesses would all be much restricted if the wearers were allowed to use their old hats until worn sufficiently to demand new ones.

Every woman who studies this year's fashion-plates and finds that she an hardly re-trim her old hat because of change in shapes, realizes that not she but the milliners control the styles in hats. They may like to make it appear that a demand for the change comes from the ultimate consumer but as yet 99 per cent. of the ultimate consumers do not know what the change will be until they see the "Ladies' Home Journal" or the "Woman's Home Companion" such a pretext is nonsense. The millinery trade controls the wires that re-create the fashions.

And so it is all down the line of city-made goods. If the country communties are to turn the trade balances back to a position favorable to them they must fight the advertisers with their own fire. A few country districts have already learned this. Hood River apples for instance sells at 25 cents apiece, not because of their superior quality but because of the organized advertising that has educated a certain class of consumers to demand such apples at any price. Such advertising has been supplemented with proper growing and packing and all the other details of successful marketing but exactly the same fruit without the advertising would never have made land worth several thousand dollars an acre in Hood River. Hood River has turned the trade balances in its favor because it has made it stylish to eat Hood River apples.

Why shouldn't the fruit growers of West Virginia, Virginia, Maryland and Pennsylvania unite on an advertising campaign and make it stylish to have Grimes Golden apples at all times in the fruit dish and York Imperial apple pie with which to finish every meal?

The conditions in the apple trade appear to the writer very favorable for the taking up at this time such a campaign. Growers are gradually learning that they place themselves in a very weak position when they sit around and wait for the cash buyers to come to them to get their apples. With the apples ready to pick, no storage facilities provided and no means of getting in touch with consuming markets many growers this last year were forced at the last minute to take whatever they could get irrespective of what the market warranted.

Others growers, and wiser ones in my judgment, turned over to expert selling agencies the inspection and marketing of their crops on five year contracts. Such a contract enables them to concentrate their energy upon the successful production of their apples knowing that they will get for them the best that the market affords, and at the same time enables the commission man to begin a year ahead to help create the market for next year's crop knowing that he, and not someone else, will have that crop to handle.

The further development of this idea until the bulk of the apples of these four states would be put into the markets through well established and strong selling agencies would produce the machinery through which I believe we could control very largely the styles in apples as the hat trade does in men's derbies.

From correspondence and conversation with growers and commission men I am convinced that a considerable number of both would be mutually glad to enter into long term contracts if the matter were presented to them in such a way and under such auspices as to have their confidence. I suggest, therefore, that at the meetings held this winter of the state horticultural societies of West Virginia, Virginia, Maryland and Pennsylvania that committees already existing or new committes if necessary be instructed to confer with similar committees of the other three state societies to adopt a recommended form of selling contract between growers and selling agencies, to provide for securing funds for advertising appropriation and advertising agency to be recognized as an official agency of the four state societies to carry out such an advertising plan.

As details for consideration by these committees I suggest: First that the form of contract recommended be for not less than five years duration; that it provide for high standards of pack and thorough supervision; that it require of the selling agency strict accountability but that it give him very free hand in meeting the market conditions and that it provide that 2 per cent. of the gross sales under such contract, one per cent. to come out of the grower and one per cent out of the selling agency, be turned over to the officially designated advertising agency to finance an advertising campaign to make our apples stylish in the city markets.

To the advertising agency that may be selected this suggestion is offered: Already the York Imperial apple is favorably known in many southern markets, where the house-wives have learned to call for the big red lop-sided apple. This style in apple should be encouraged. If all of the house-wives can be persuaded to do the same thing and taught also to send back other apples if the corner grocer is so unwise as to send a substitute around to her, the retailers and the wholesalers will eventually be forced to stock with York Imperial apples. To get the same they must come to some orchard in our section of the country beginning with Adams county, Pa., in the North and ending practically with Augusta County, Virginia, in the South, and only a few miles wide. Outside of this limited area there may be some York Imperials grown but not many. In other words there is this unique situation in a restricted area producing for some years a commercial crop of York Imperial apples cannot exceed a few hundred thousand barrels this must all come from comparatively small territory in the Shenandoah, Cumberland and Potomac valleys. This apple is already favorably known in certain markets so located geographically as to be most available from this section. It is an apple of such peculiar shape that any house-wife, however ignorant previously she may have been of apples, can be easily taught to identify it.

Prosperous cities have grown up around manufacturing plants producing patented articles with which other plants could not compete but almost without exception one of the most important departments of such a plant putting out a specialty has been its advertising department.

Why shouldn't we in this section so organize and so advertise that we can dictate the styles in apples in certain markets particularly with reference to the York Imperial. Every apple of this variety bears its own trade-mark, which we alone are producing in commercial quantities.

If the West Virginia, Virgina, Maryland and Pennsylvania state societies will appoint committees, who can get together and organize so as to devise and work a plan along this line which should be possible for this section to get back in extra profits from our apples some of the hard-earned money that we have sent to the cities for stylish and high-priced but not yet needed derbies, hats, etc.

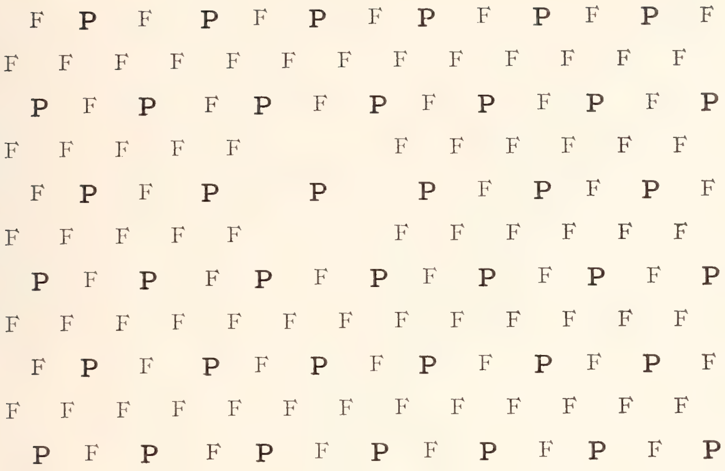

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Fig. 1.

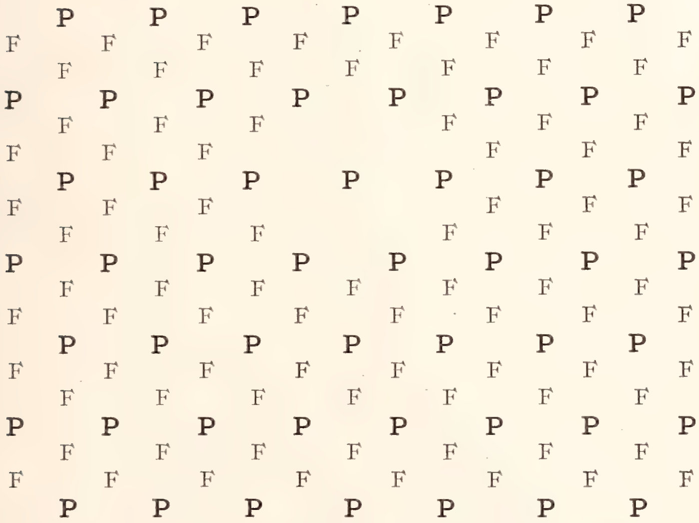


Fig. 2.

Two Methods of Hexagonal Planting With Fillers.

"P" represents Permanent Trees and "F" shows location of fillers. Fillers are omitted in center of each illustration to show more clearly appearance of orchard after fillers are removed. It will be noticed in Fig. 2 that each filler occupies the exact center of an equilateral triangle formed by the permanent trees. Fig. 1 is probably best where small growing sorts are planted as fillers among larger growing varieties. Fig. 2 is better when planting only one variety, which must be thinned when approaching maturity.

BIGLERVILLE
NATIONAL BANK

BIGLERVILLE, PA.

Capital - - -	*$50,000.00*
Surplus and Undivided Profits	*25,000.00*

Pays 3½% on Time Deposits
Your Account Solicited

¶ We call the attention of fruit buyers to the advantages of Biglerville as a shipping point, and especially to the facilities offered by this bank for making collections on shipments of fruit to any point in the United States.

C. L. LONGSDORF, Pres. *R. H. LUPP, V. Pres.*
E. D. HEIGES, Cashier

REPORT OF COMMITTEE ON FRUIT EXHIBIT.

DR. I. H. MAYER, MR. CLARK ALLIS, MR. AARON NEWCOMER.

Your Committee on Fruit beg leave to offer the following report: The exhibit consists of about 270 plates and 15 boxes of apples, one plate of pears, one plate of sweet potatoes and two plates of corn. Twenty-five exhibitors contributed and your Committee desires to compliment each and everyone upon the high quality of the exhibits, as follows:

Rufus Lawver, 8 plates—

2 plates Stayman.
2 plates Winesap.
1 plate Stark.
2 plates Sutton.
1 plate for name.

John N. Peters,
8 plates York Imperial.

C. A. Wolfe,
9 plates York Imperial.

H. E. Wolfe, 3 plates—

1 plate York Imperial.
1 plate Willow Twig.
1 plate Mammoth Black Twig.

W. S. Adams, 12 plates—

1 plate Pound.
1 plate Sutton.
3 plates Rome Beauty.
1 plate Winter Rambo.
2 plates Peck's Pleasant.
3 plates Jonathan.
1 plate Smokehouse.

E. P. Garrettson, 56 plates—

2 plates Paradise.
4 plates York Stripe.
9 plates Red Doctor.
2 plates Smokehouse.
5 plates Baltzley.
6 plates York County Cheese.
1 plate Sweet Potatoes.
4 plates Smith Cider.
5 plates Cole.
7 plates Stayman
2 plates Grimes.
2 plates Summer Rambo.
8 plates York Imperial.

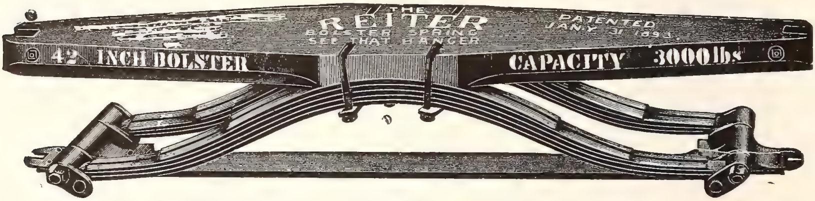
Z. J. Peters, 3 plates—

2 plates Smokehouse.
1 plate York Imperial, 1910 crop kept in cellar.

John H. Miller,
2 plates for name.

THE "REITER"

BOLSTER SPRING



See That Hanger

The best bolster spring made. Complete and ready for use as sold. Warranted and guaranteed in every way. These springs are just what **FARMERS, GARDNERS, FRUIT GROWERS, PEDDLERS, DAIRYMEN and TEAMSTERS want,** as they will make their rough wagons ride as easy as any Spring Wagon, thus saving them the cost of Spring Wagons and enabling them to deliver their Fruits, Vegetables, Eggs, etc., unbruised and unbroken from hauling and in as good condition as when they left home.

WITH
The Reiter Bolster Spring
ON THE
American Farm Wagon
you can haul or carry any and everything equal to any spring wagon and at one-half the cost.

With taese Springs on, wagons will pull esier and last longer, harness wear longer and horses work easier.

These Springs don't work on top of the Bolster, like other Bolster Springs, but on each side in shackles, on the same principle as any high priced Spring Wagon. These Springs can't be broken by overloading or rebounding like a Spring Wagon.

By overloading, the springs will work down on each side of the Bolster and the wagon will become rough again. In fast driving over rough roads the springs, not being attached to the bed or bolster, can't be broken by rebounding or lifting up of the bed.

No one using a rough wagon should be without The Reiter Bolster Spring, as they will save the cost the first year. Remember they are warranted and guaranteed in every way. Made to carry from 1,000 to 10,000 pounds. Measure your wagon between standards and order a set; give them a fair trial and let your neighbors, friends and the dealer you got them from know what you think of them.

W. C. REITER, Sole Maker

Prices on Application. **WAYNESBORO, PA.**

Robert Eldon, 15 plates—

2 plates Baldwin.
1 plate Fallowater.
1 plate Grimes.
3 plates Stayman.
4 plates Ben Davis.
2 plates Rome Beauty.
3 plates Jonathan.

C. A. Griest, 2 plates—

1 plate Smith Cider.
1 plate Mann.

C. S. Griest's Sons, 7 plates—

2 plates Ben Davis.
5 plates York Imperial.

B. F. Wilson, 40 plates—

13 plates York Imperial.
5 plates Smokehouse.
3 plates Smith Cider.
1 plate Mann.
3 plates Paradise.
11 plates Jonathan.
4 plates York Stripe.

H. C. Pitzer, 15 plates—

3 plates Paradise.
8 plates York Imperial.
2 plates Smith Cider.
2 plates Grimes.

Robert Garrettson, 11 plates—

3 plates Ben Davis.
2 plates Stark.
1 plate Belleflower.
1 plate King.
4 plates York Imperial.

J. V. Garrettson, 20 plates—

4 plates Paragon.
2 plates Baldwin.
1 plate Hubbardson.
2 plates Stark.
2 plates Strinetown Pippin.
5 plates York Imperial.
1 plate York County Cheese.
1 plate Coal.
2 plates Lehigh.

C. E. Raffensperger, 12 plates—

4 plates York Imperial.
1 plate Domine.
2 plates York Stripe.
1 plate Hubbardston.
1 plate Grimes Golden.
3 plates Red Doctor.

H. M. Keller, 12 plates—

2 plates Lady Blush.
8 plates York Imperial.
1 plate Stayman.
1 plate York Stripe.

C. W. Peters, 9 plates—

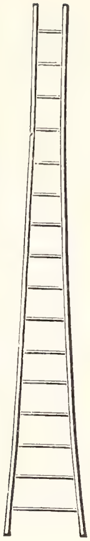
4 plates York Imperial.
3 plates Winesap.
2 plates York County Cheese.

M. F. Stoner,

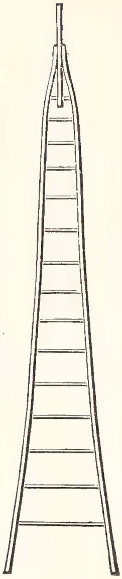
1 plate Griffins Beauty.

E. H. Snyder & Son, 5 plates—

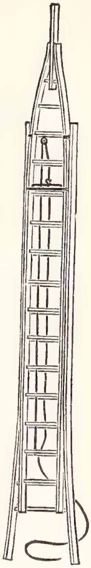
2 plates Rome Beauty.
1 plate Ben Davis.
2 plates Nero.



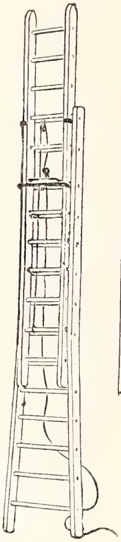
OPEN TOP SINGLE



POINTED TOP, SINGLE LADDER



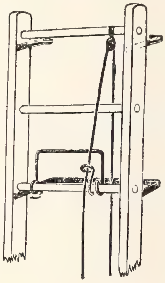
POINTED TOP, BALE LOCK EXTENSION



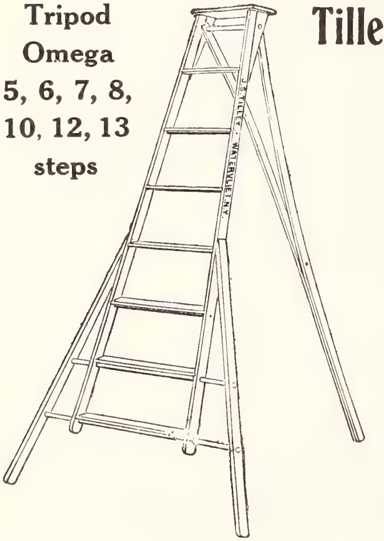
This is the most convenient orchard ladder ever produced for trimming trees and picking fruit. Entirely new, works perfect.

Bale Lock Extension

Quick and Positive



Always keep rope hand close to ladder when operating top section. Pull rope to raise the traveling section. To lower traveling section carry the hand slightly to the right while Bale is in vertical position. To lock it, carry hand to the left, always keeping rope hand close to the ladder and the Bale will drop in position and lock it secure.



J. S. TILLEY WATERVLIET, N.Y.

Tripod Omega 5, 6, 7, 8, 10, 12, 13 steps

Tilley's Omega Tripod Step Ladder

"First-class in every respect. Stiff, rigid, light and durable. All flat steps to stand on. The two lower steps are supported by, and rest on rounds which tie, support and thoroughly brace the main ladder. Fully covered by patents dated December 26, 1910."

"Beware of false statements from unscrupulous competitors who are trying to force the sale of their inferior goods by intimidation. **The Patentee and Manufacturer is responsible, reliable, able and willing to protect his patrons and himself against bluffers."**

JOHN S. TILLEY

Manufacturer of Ladders and Step Ladders of every description

Factory, WATERVLIET, N. Y.

Represented in Pennsylvania by

EDWIN C. TYSON, Flora Dale, Pa.

Oscar Rise, 6 plates—

1 plate Jonathan.
2 plates Stayman.
1 plate Winesap.
2 plates York Imperial.

Rice Bros., 3 boxes—

1 box Paragon.
1 box York Imperial.
1 box Griffins Beauty.

Tyson Bros., 9 boxes—

2 boxes York Imperial.
7 boxes Stayman.

Jacob Garrettson, 2 plates—

1 plate Hickory King Corn.
1 plate Leaming Corn.

The apples are well developed-only a few showing blemishes. The boxed apples were well graded, and the fact that all, excepting one box, were packed four tier, led your Committee to notice the size of many of the plate specimens. We hasten to say that size is not everything, but size is, we have been told, the one thing lacking in eastern apples. We determined the circumference of many of the specimens exhibited, and wish to place on record the following:

Summer Rambo,	12½ in.	Red Doctor,	11¼ in.
Cole,	13 “	York Stripe,	11½ “
Stayman Winesap,	12 “	York Imperial,	11½ “
King,	12½ “	Jonathan,	10¼ “
Rome Beauty,	12 “	Baltzley,	13¼ “
Nero,	10½ “	Fallowater,	12 “
Stark,	12 “	Sutton's Beauty,	11½ “
Black Twig,	12 “	York County Cheese,	9 “
Paradise,	11 “	Griffins Beauty,	10 “
Summer Rambo,	13 “		

And we might continue the investigation as to size with corresponding figures. We know that even figures can be made to lie, but the figures given can be verified, and will be found in nearly all cases quite conservative.

Given color and finish, such as these exhibits show, plus size, and above all, quality, such apples will command the best markets not only in the east, but everywhere.

I. H. Mayer, M. D.,
Commercial Horticulturist, Willow Street, Pa.
Clark Allis,
Commercial Orchardist, Medina, N. Y.
Aaron Newcomer,
Commercial Peach Grower, Smithburg, Md.

2-Yr. Old Apple Tree Set with Du Pont Dynamite

Make New Orchards Yield Early Fruits

DO this by breaking up the hard, impervious subsoil. The young, tender roots will then have access to an abundance of nutritious plant food stored in this larger growing area.

Start your new orchards in the quickest, cheapest and simplest way by planting trees with

DU PONT

Red Cross Low Freezing Dynamite

The shattered subsoil allows growing space for expanding roots. Makes deeper, broader, richer, moister root-making areas free from destructive insects, grubs and fungus growth. Dynamiting conserves necessary moisture and makes the soil open to air and rainfall.

The two pictures represent Bellflower apple trees in orchard of Mrs. John Rawley, Grant's Pass, Ore., April 1911, The tree planted in dynamited hole is two years old, Nov. 1909 and June 1910 branches pruned. Photograph above, taken April 15, 1911, shows a vigorous tree with healthy and fine colored foliage.

The tree in lower picture is of same stock, planted in spade dug hole, given same cultivation after planting as other tree. Slow growth prevented pruning. Its trunk is less than half-inch in diameter—many branches of dynamited tree are larger than this. Not one of 250 trees planted in dynamited holes died—a proof that Du Pont Dynamite insures sure, rapid, vigorous growth in all orchards.

Address Dept. 18 for "Tree Planting" Booklet

E. I. du Pont de Nemours Powder Co.

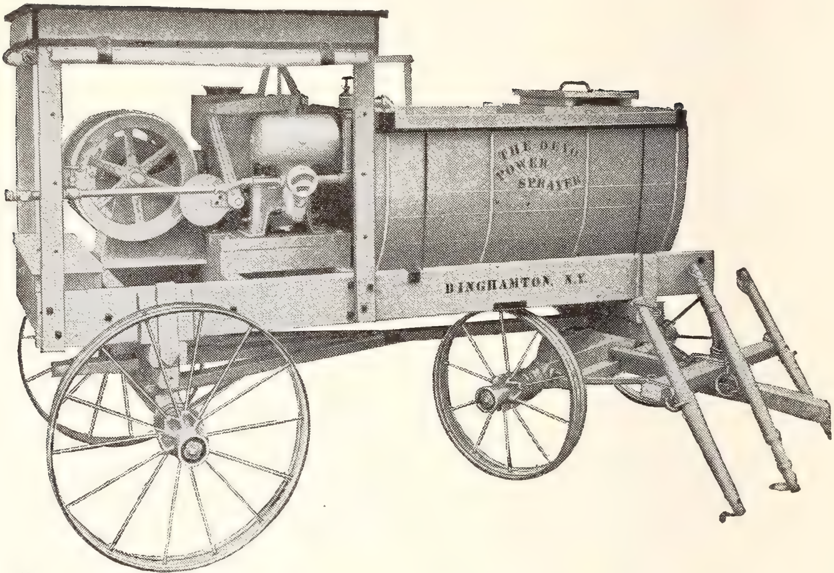
Established 1802 :: Wilmington, Delaware

2-Yr. Old Tree Set with Spade

ADAMS COUNTY FRUIT RECORDS

Shipments Over Gettysburg & Harrisburg R. R.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gettysburg,	1905	318	333	651	4	1	.....	.....	.....
(G. & H. R. R.)	1906	28	.....	28	....	....	.....	.....	.....
	1907	127	.....	127	1	....	$2.25	.....	.....
	1909	12	.....	12	....	....	.....	.....	.....
	1910	50	.....	50	....	....	.....	.....	.....
	1911	41	.....	41	....	....	.....	.....	.....
Biglerville,	1903	8813	987	9800	65	....	.....	.....	.....
	1905	7932	.....	7932	53	2	.....	.....	.....
	1906	2785	165	2950	20	....	1.00	$0.70	.....
	1907	17164	4216	21380	142	12	2.20	1.50	$0.50
	1908	4956	.....	4956	33	6	1.40	.75	.65
	1909	10785	137	10922	73	1	2.50	1.50	.55
	1910	20017	1500	21517	144	10	2.00	.....	.....
	1911	37897	552	38449	256	....	2.00	.....	.....
Guernsey,	1903	2870	2413	5283	35	....	.....	.....	.....
	1905	1771	1166	2937	20	11	.....	.....	.....
	1906	1414	1329	2743	18	2	.....	.....	.....
	1907	4798	2760	7858	52	15	2.35	1.50	.55
	1908	2173	.....	2173	15	7	1.50	.....	.65
	1909	7320	.....	7320	49	5	2.50	.....	.55
	1910	11659	1267	12926	86	12	2.00	.....	.....
	1911	13600	363	13963	93	....	2.00	.....	.....
Bendersville,	1903	4163	.....	4163	28	....	.....	.....	.....
	1905	4000	2351	6351	42	16	.....	.....	.....
	1906	1109	1561	2670	18	20	.....	.....	.....
	1907	2824	6268	9092	61	22	2.25	1.50	.50
	1908	2264	.....	2264	15	21	1.40	.....	.65
	1909	3531	1200	4731	32	15	2.50	1.50	.50
	1910	5628	2132	7760	52	30	2.00	.....	.....
	1911	8894	366	9260	62	7	2.00	.....	.....



The Best Spraying Equipment Money Can Buy

THE OWNER OF A DEYO POWER SPRAYER knows that he has a completely equipped outfit and no extras to buy.

HE KNOWS that it is operated by a DEYO engine and will run whenever he wants it and as long as he wants to use it.

HE KNOWS that the tank is built of selected material by expert workmen.

HE KNOWS that the mechanically operated agitator assures him of a perfect mixture at all times.

HE KNOWS that he has a short rig with which he can make any turn in his orchard.

HE KNOWS that there are no belts or chains to catch on limbs or clothing.

HE KNOWS that he can disconnect the engine from the pump in one minute and use it for any power purpose, and then connect it to the pump in another minute.

HE KNOWS that he has the best sprayer that money and brains can build.

BUY A DEYO POWER SPRAYER AND LET THE OTHER FELLOW WORRY.

We have a large catalog completely describing the **DEYO POWER SPRAYERS,** which we will gladly mail you. Write for it to-day.

Deyo-Macey Engine Co.

BINGHAMTON, NEW YORK

Adams County Fruit Records

Shipments Over Gettysburg & Harrisburg R. R.—(*Continued*)

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gardners,	1903	997	985	1982	13	....	.....	.....	.....
	1905	912	5215	6127	41	4	.....	.....	.....
	1906	.....	.....	.....	....	....	.....	.....	.....
	1907	6905	5440	12345	82	4	$1.75	$1.50	$0.50
	1908	433	.....	433	3	1	.....	.....	.....
	1909	2275	4571	6846	46	....	.....	1.35	.....
	1910	1566	3722	5288	35	1	.....	.....	.....
	1911	3900	4800	8700	58	....	2.00	.....	.....
Starners,	1905	682	1016	1698	11	5	.....	.....	.....
	1906	664	133	797	5	4	.....	.....	.....
	1907	1572	219	1791	12	3	.....	.....	.....
	1908	487	.....	487	3	3	1.50	.....	.65
	1909	1825	8	1833	12	4	2.50	.....	.55
	1910	2500	2192	4692	31	3	2.00	.....	.....
	1911	2018	668	2686	18	2	2.00	.....	.....
Hunters Run,	1903	625	.....	625	4	....	.....	.....	.....
(Good year)	1905	160	160	320	2	8	.....	.....	.....
	1906	295	262	557	4	5	1.50	.75	.50
	1907	1417	514	1931	13	12	1.75	.85	.50
	1908	1704	.....	1704	11	1	1.50	.....	.....
	1909	1289	510	1799	12	1	2.50	.....	.....
	1910	2103	2190	4293	29	1	.....	.....	.....
	1911	3750	300	4050	27	....	2.00	.....	.....
G. & H. R. R.,	1903	17468	4385	21853	146	....	.....	.....	.....
Total	1905	15617	9908	25525	170	47	.....	.....	.....
	1906	6295	3450	9745	65	35	.....	.....	.....
	1907	34797	19217	54014	360	56	.....	.....	.....
	1908	12017	.....	12017	80	39	1.45	.75	.65
	1909	27037	6426	33463	223	26	2.50	1.50	.55
	1910	43523	13003	56526	377	57	2.00	.....	.50
	1911	70100	7049	77149	514	9	2.00	.....	.....

Gardners—1906, 2 cars pears; 1907, 1 car pears; 1908, 2 cars pears; 1910, 2 cars pears, 4 cars peaches; 1911 5 cars pears.

Bendersville—1908, 2 cars pears; 1910, 1 car pears; 4 cars peaches; 1911, 1009 baskets peaches, 3 cars pears.

Hunters Run—1908, 1 car pears; 1910, 1 car pears; 1 car peaches.

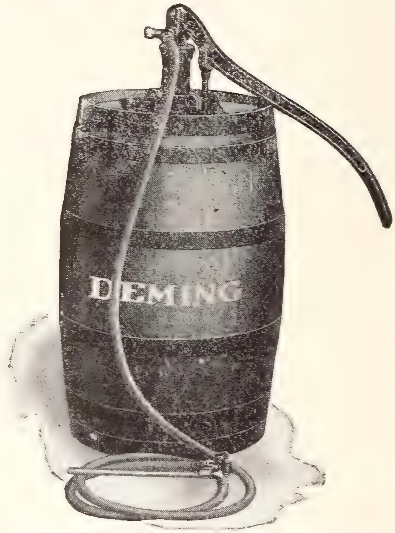
Biglerville—1910, 1 car cherries; 4 cars cider syrup; 43 cars canned apples; 5 cars evaporated apples; 1911, 3 cars cider syrup, 100 cars canned apples; 8 cars evaporated apples.

Guernsey—1910, 7 cars peaches; 1911, 210 pkgs. pears; 240 pkgs. plums; 650 pkgs. cherries.

Starners—1910, 2 cars peaches; 1911, 300 bushels pears; 200 baskets peaches.

Deming Spray Pumps

WHY You Should Use Them



"Century" Barrel Spray Pump. Has submerged cylinders ; all brass working parts. Easy to operate ; will maintain strong and steady pressure.

YOU know now that you can raise better fruit and more of it at that—**IF YOU SPRAY.** You can get better results with a Deming outfit because it will require fewer repairs—is better able to stand the rough usage—than any other pump. We can make a better pump because we have better facilities—larger factory—longer experience.

¶ Our book, "How My Old Orchard Paid," gives the experiences of a Pennsylvania farmer who used a Deming Sprayer. It's interesting and valuable. Send for it and our Spray Pump Catalogue.

THE DEMING COMPANY
SALEM, OHIO
Manufacturers of Hand, Windmill and
Power Pumps

HARRIS PUMP & SUPPLY CO.
PITTSBURGH, PA.
General Distributing Agents

Adams County Fruit Records—(*Continued*)

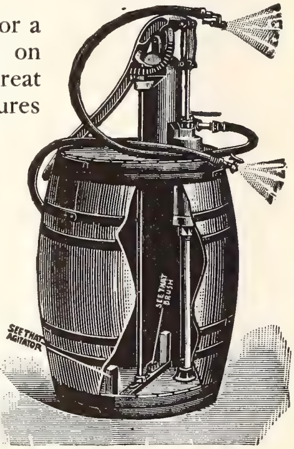
Shipments Over Western Maryland R. R.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Fairfield,	1905	1215	809	2024	13	3	.....	.....	.....
	1906	300	.....	300	2	2	.....	.....	.....
	1907	300	.....	300	2	2	.....	.....	.....
	1908	.....	.....	.....	....	....	.....	.....	.....
	1909	.....	.....	.....	....	....	.....	.....	.....
	1910	.....	560	560	....	4	.....	.....	.....
	1911	.....	.....	.....	....	....	.....	.....	.....
Virginia Mills,	1907	320	8800	9120	61	....	.....	.....	.....
	1908	.....	1620	1620	11	1	.....	.....	.....
	1909	326	1519	1845	12	....	.....	.....	.....
	1910	.....	30	30	....	....	.....	.....	.....
	1911	.....	.....	.....	....	....	.....	.....	.....
Orrtanna,	1903	3300	.....	3300	22	....	.....	.....	.....
	1905	1062	.....	1062	7	....	.....	.....	.....
	1906	3659	.....	3659	24	....	.....	.....	.....
	1907	3177	2342	5519	37	1	$2.00	$1.50	$0.50
	1908	2686	1020	3706	25	....	.....	.....	.....
	1909	741	840	1581	10	....	2.40	1.50	.....
	1910	8216	4045	12261	82	½	.....	.....	.....
	1911	7043	3846	10889	73	....	2.00	.....	.....
McKnightstown,	1903	3438	.....	3438	23	....	.....	.....	.....
	1905	7895	178	8073	54	1	.....	.....	.....
	1906	2296	254	2550	17	1-6	1.00	1.00	.47
	1907	3393	1155	4548	30	3	2.15	1.85	.50
	1908	1785	251	2036	13	....	1.75	.....	.....
	1909	7724	2030	9754	65	1-3	2.50	1.50	.....
	1910	14275	1800	16075	107	2	.....	.....	.....
	1911	26297	2231	28528	190	¼	2.00	.....	.....
Seven Stars,	1906	28	.....	28	....	....	.....	.....	.....
	1907	63	.....	63	....	....	.....	.....	.....
	1908	42	.....	42	....	....	.....	.....	.....
	1909	50	.....	50	....	....	.....	.....	.....
	1910	26	4	30	....	....	.....	.....	.....
	1911	175	400	575	4	....	2.00	.....	.....

SPRAY

Ask us to send you Spraying Calendar and Directions---FREE

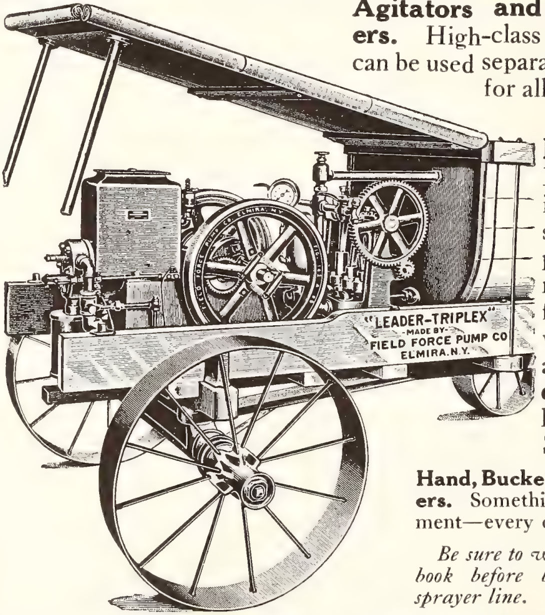
NO matter whether yours is a large or a small spraying contract, our book on Spraying and Sprayers will be a great help to you. It tells you what spray mixtures to use, how to prepare mixtures, when to spray and how to spray to secure the best results.



A SPRAYER to Suit Your Needs

Our line includes everything from the small hand sprayer up to our Watson-Ospraymo Potato sprayers and our famous Power Orchard Spraying Rigs.

Our **LEADER** Orchard Sprayers—are typical modern machines for large spraying operations. Equipped with liquid **Agitators and Strainer-Cleaners.** High-class Gasoline Engine—can be used separately to furnish power for all kinds of farm work.



The **EMPIRE KING**—the old reliable Barrel Spraying Outfit. A great sprayer for general purpose work, sole reliance of thousands for spraying fruit, vegetables, shrubbery and small trees. **Mechanical Agitation** of liquid **Automatic-Strainer** cleaners.

Hand, Bucket and Knapsack Sprayers. Something to suit every requirement—every one the best of its kind.

Be sure to write and get our sprayer book before buying anything in the sprayer line. Mailed free. Address:

FIELD FORCE PUMP CO. **11th St., East ELMIRA, N. Y.**

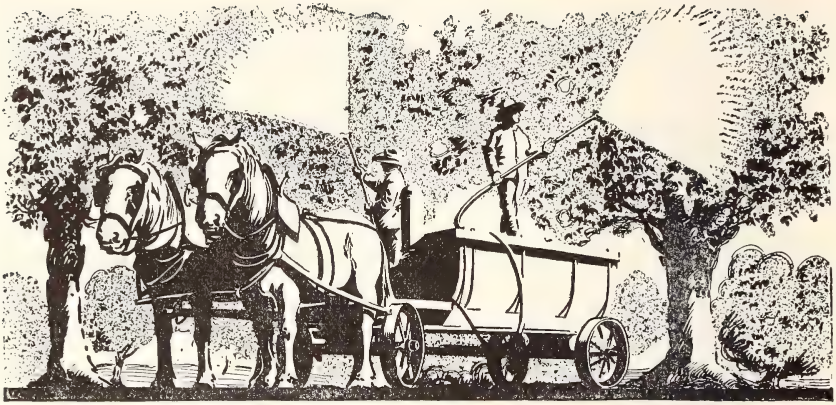
GEO. H. HOFFMAN, Agent, Arendtsville, Pa.

Adams County Fruit Records—(*Continued*)

Shipments Over Western Maryland R. R.—(*Continued*)

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gettysburg, ... (W. M. R. R.)	1906	13	.....	13	....	....	.....	.....	.....
	1907	18	.....	18	....	....	.....	.....	.....
	1908	23	.....	23	....	....	.....	.....	.....
	1909	22	.....	22	....	....	.....	.....	.....
	1910	428	.....	428	3	....	.....	.....	.....
	1911	36	.....	36	....	1	.....	.....	.....
New Oxford, ...	1907	.....	1033	1033	7	....	.....	.....	.....
	1908	.....	.....	.....	....	....	.....	.....	.....
	1909	.....	276	276	2	....	.....	.....	.....
	1910	.....	695	695	4¾	....	.....	.....	.....
	1911	390	.....	390	2½	....	.....	.....	.....
Abbottstown, ...	1907	382	618	1000	7	....	.....	.....	.....
	1908	.....	.....	.....	....	....	.....	.....	.....
	1909	.....	.....	.....	....	....	.....	.....	.....
	1910	.....	.....	.....	....	....	.....	.....	.....
	1911	.....	.....	.....	....	....	.....	.....	.....
East Berlin, ...	1905	50	.....	50	....	....	.....	.....	.....
	1906	1140	1193	2333	15	1-3	$1.80	$0.90	$0.70
	1907	49	.....	49	....	½	2.25	2.25	.60
	1908	.....	.....	.....	....	....	.....	.....	.....
	1909	10	205	215	2	....	.....	.....	.....
	1910	1	1	2	....	....	.....	.....	.....
	1911	18	160	178	1	....	.....	.....	.....
W. M. R. R. .... Total	1903	6738	.....	6738	45	....	.....	.....	.....
	1905	10380	1320	11700	78	5	.....	.....	.....
	1906	7447	1447	8894	59	3	.....	.....	.....
	1907	7720	13948	21668	144	7	.....	.....	.....
	1908	4536	2891	7427	49	1	1.75	.....	.....
	1909	8873	4870	13743	91	1-3	2.50	1.50	.....
	1910	22946	7135	30081	201	2½	.....	.....	.....
	1911	33959	6637	40596	270	1¼	2.00	.....	.....

Littlestown—1910, 3 cars apples, 2 cars potatoes; 1911—2 cars apples.
Dillsburg—1910, 2 cars apples; 1911; 2 cars apples.
McKnightstown—1911, 1 car pears.
Orrtanna—1911, 620 baskets peaches.
Charmian—1911, 48 barrels apples.



Save Your Fruit From Damage.

THE widespread increase of the codling moth and other insects injurious to fruit trees causes an annual loss to growers of seven million dollars a year. The surest way for you to prevent your fruit from being wormy or badly damaged is to carry out a regular plan of spraying with some reliable material.

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NEW PROCESS ARSENATE OF LEAD

is a general insecticide for all leaf-eating insects. It is superior to many other brands on the market, because it contains the arsenic in exactly the right proportion and the proper chemical combination, thus insuring a material that will not injure or scorch the foliage but is sure death to insects feeding on the leaves. It is extremely miscible in water and will combine readily with Lime-Sulfur and Bordeaux Mixture. Light in gravity, it remains well in suspension so that a uniformly poisonous spray can be thrown from the finest nozzle. For prices and further information on this product, come in and see us. 69A

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Save your fruit and crops from damage with

Sherwin-Williams High Quality Insecticides

- S-W New Process Arsenate of Lead (Paste)
- S-W New Process Arsenate of Lead (Powdered)
- S-W Lime-Sulfur Solution
- S-W Paris Green
- S-W Bordeaux Mixture
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- S-W Carbolinol (Vermicide)

Send for our Hand-book, "Spraying a Profitable Investment"

THE SHERWIN-WILLIAMS CO.

Manufacturers High Quality
Insecticides and Fungicides

PHILADELPHIA, PA.
NEWARK, N. J.

Adams County Fruit Records—(*Continued*)

Total Fruit Marketed in County.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Total shipped, ...	1903	24206	4385	28591	191	....	.....	.....	.....
	1905	25997	11228	37225	248	52	.....	.....	.....
	1906	13742	4897	18639	124	38	.....	.....	.....
	1907	42517	33165	75682	504	63	.....	.....	.....
	1908	16553	2891	19444	129	40	$1.50	$0.75	$0.60
	1909	35910	11296	47206	314	27	2.50	1.50	.50
	1910	67219	20138	87557	583	61½	2.00	1.20	.50
	1911	104659	13686	118345	789	10	2.00	.75	1.00
Evaporated, ...	1903	......	6547	6547	44	....	.....	.....	.....
	1905	......	10670	10670	71	....	.....	.....	.....
	1907	......	8333	8333	56	....	.....	.75	.....
	1908	......	......	......	....	....	.....	.....	.....
	1909	......	4666	4666	31	....	.....	.....	.....
	1910	......	8600	8600	57	....	.....	.....	.....
	1911	......	21750	21750	145	....	.....	.....	.....
Canned, ...	1905	......	2400	2400	16	....	.....	.....	.....
	1907	......	10000	10000	67	....	.....	1.00	.....
	1908	......	1673	1673	11	....	.....	.....	.....
	1909	......	12398	12398	82	....	.....	.....	.....
	1910	......	16700	16700	111	....	.....	.....	.....
	1911	......	25000	25000	167	....	.....	.....	.....
Cider, ...	1907	......	9524	9524	63	....	.....	.....	.....
	1908	......	6670	6670	44	....	.....	.....	.....
	1909	......	5714	5714	38	....	.....	.....	.....
	1910	......	11120	11120	74	....	.....	.....	.....
	1911	......	12500	12500	83	....	.....	.....	.....
Total fruit, ...	1903	24206	10932	35138	234	....	.....	.....	.....
	1905	25997	24298	50295	335	52	.....	.....	.....
	1906	13742	4897	18639	124	38	.....	.....	.....
	1907	42517	61022	103539	690	63	2.25	1.75	.55
	1908	16553	11234	27787	185	40	1.50	.75	.60
	1909	35910	34074	69984	465	27	2.50	1.50	.50
	1910	67219	56558	123777	825	61½	2.00	1.20	.50
	1911	104659	72936	177595	1184	10	2.00	.75	1.00

Comparison of Percentages

Year	Per Cent. barreled	Per Cent. sold bulk	Per Cent. evaporated	Per Cent. canned	Per Cent. cider	Per Cent. total fruit compared to 1903
1903	70	12	18	......	.....	100%
1905	52	22	26	......	.....	143%
1907	41	32	8	10	9	295%
1909	51	16	7	18	8	200%
1910	54	16	7	14	9	356%
1911	59	8	12	14	7	500%

TO RAISE GOOD FRUIT or VEGETABLES YOU MUST

SPRAY

"ORCHARD BRAND"

SPRAY MATERIALS

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Known and used by the best Fruit and Vegetable Growers.

"ORCHARD BRAND"

LIME SULPHUR SOLUTION

A combined scale remedy and Fungicide.

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A Scale remedy for Apple and Pear trees, Ornamental Shrubbery and Hedges.

ARSENATE OF LEAD

For all leaf eating or chewing insects.

BORDEAUX MIXTURE

A Fungicide.

ZINC ARSENITE

An Insecticide.

BORDEAUX ARSENATE LEAD MIXTURE

A Fungicide and Insecticide.

ATOMIC SULPHUR

The best known Fungicide.

ATOMIC SULPHUR combined with ARSENATE OF LEAD

A complete Fungicide and Insecticide.

ATOMIC SULPHUR combined with ZINC ARSENITE

A remedy for the control of Bugs and Blight on Potatoes and similar Truck Products.

Our Farm Census Plan Will Enable You to Grow Fruit and Vegetables Successfully.

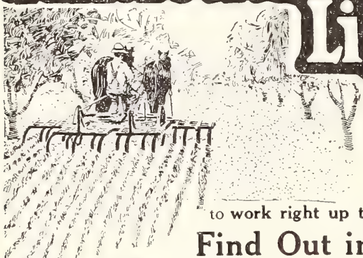
IT IS FREE — WRITE FOR BLANKS

THOMSEN CHEMICAL COMPANY

BALTIMORE, MD.

STATE COLLEGE STUDENTS AT WORK GATHERING TOMATOES.

ONE OF THE GREENHOUSES AT STATE COLLEGE, SHOWING THE STUDENT PLOTS.



Find Out About the Forkner Light-Draft Harrow!

THIS low-priced harrow for orchards and vineyards—and general use—is a world-beater. Wonderfully light of draft—weight carried on wheels, not on horses' necks. Great worker—20 to 30 acres a day with one team—and every inch of soil **cultivated thoroughly—lifted and turned in long wavy level.** Best of all—it hangs low and has great extension—making it a snap to **work right up to trees** without horse or driver disturbing boughs or fruit.

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WRITE TODAY for catalog and 30 day trial offer. Pick the machine suited to your soil and orchard and use it for a month—**and send it back if you don't find it the finest cultivator made.**

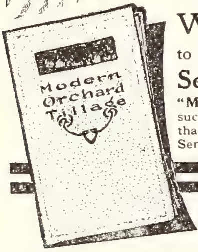
Send for This Free Book

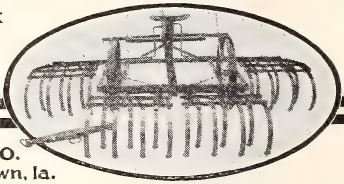
"Modern Orchard Tillage"—written by highly successful orchardist—contains information that may be worth hundreds of dollars to you Sent for the asking.

Light Draft Harrow Co.
910 E. Nevada St. Marshalltown, Ia.

Sole Pennsylvania Representative

EDWIN C. TYSON, Flora Dale, Pa.





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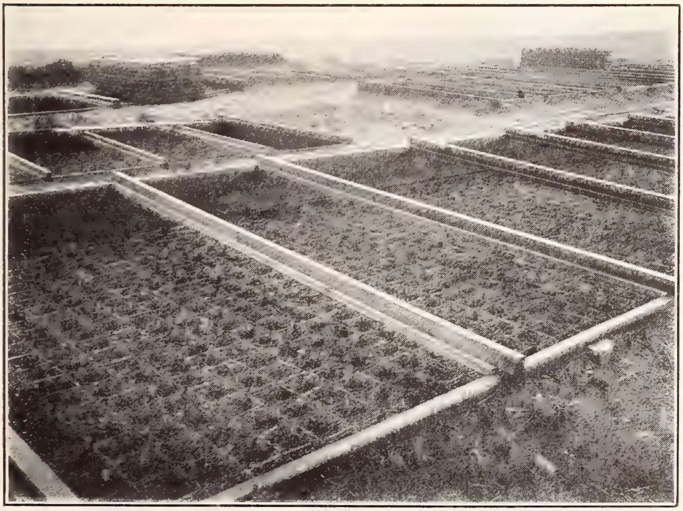

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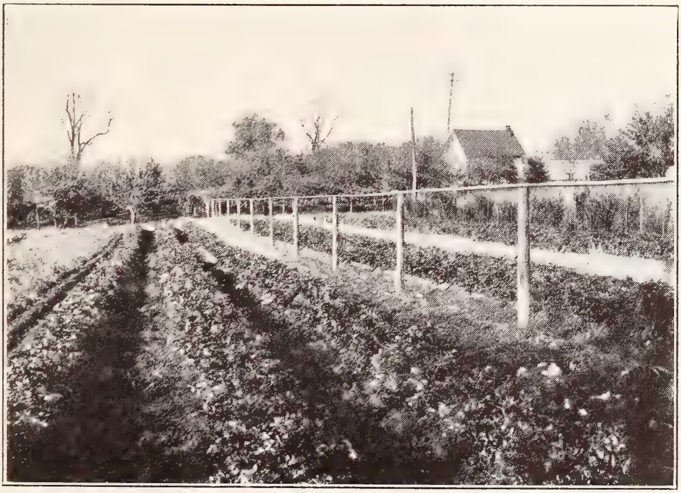

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INDEX

A

- Addresses—
  - President's, 23-25
  - "Apple Diseases," 26-32
  - "Peach Culture," 33-38
  - "The Influence of Fertilization and Other Factors Upon Yield, Color, Size and Growth in Apples," 39-53
  - "Size, Color and Quality in Fruits," 54-62
  - "The Making of Concentrated Lime-Sulphur and its Use on Apples and Peaches," 63-65
  - "Educating an Orchard," 66-70
  - "Cold Storage a Necessity," 83-90
  - "Business Methods in Marketing Apples," 91-98
  - "Eastern Fruit Growers' Association, Its Plans and Prospects," 99-106
- Apple-Diseases, 26-32
  - Importance of Grading, 94
  - Varieties, 97
  - Scab, 27
- Amendments, 19
- Adams, W. S. (Adv.), 136
- Ammonia Storage, 85
- Allis, Clark, 51, 66-70, 81, 83-90
- Advertisers—
  - York Chemical Works (Fertilizers), 14
  - Bateman Mfg. Co. (Sprayers), 8
  - Musselman Canning Co. (Greeting), 18
  - Goulds Mfg. Co. (Sprayers), 16
  - Bowker Insecticide Co. (Spray Materials), 2
  - U. S. Klinefelter (Barrels), 136
  - Grasselli Chemical Co. (Spray Materials), 128
  - B. G. Pratt Co. (Spray Materials), 12
  - First National Bank of Gettysburg, 134
  - Gettysburg National Bank, 130
  - J. G. Harrison & Sons (Nursery Stock), 4
  - W. C. Reiter (Bolster Springs), 110
  - P. S. Orner (Barrels), 130
  - Bendersville National Bank, 140
  - Biglerville National Bank, 108
  - The Deming Co. (Sprayers), 118
  - Field Force Pump Co. (Sprayers), 120
  - Walter S. Schell (Seeds), 22
  - Thomson Chemical Co. (Spray Materials), 124
  - John S. Tilley (Ladders), 112
  - E. I. duPont de Nemours Powder Co. (Dynamite), 114
  - Battlefield Nurseries, 130
  - Citizens' Trust Co., Gettysburg, 129
  - Light Draft Harrow Co. (Orchard Harrows), 126
  - The Sherwin-Williams Co. (Spray Materials), 122
  - Deyo-Macey Engine Co. (Sprayers), 116
  - Madison Cooper Co. (Gravity Brine Storage), 138
  - Franklin Davis Nursery Co., 134
  - G. P. Read (Packages and Cushions), 10
  - Hamilton Orchard Heater Co., 132
  - W. H. Tipton (Photograph), 132
  - Dougherty & Hartley (Dry Goods), 128
  - Edwin C. Tyson (Horticultural Requisites), 141
  - Vreeland Chemical Co. (Spray Materials), 20
  - T. S. Hubbard Co. (Grapevines and small fruits), 132
  - Horticultural Chemical Co. (Spray Materials), 6
  - W. S. Adams (Warehouse), 136

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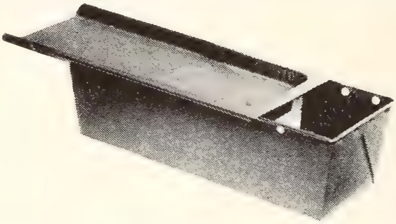

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- Adams County Fruit Records, 24
  - Gettysburg & Harrisburg R. R. Shipments, 115, 117
  - Western Maryland R. R. Shipments, 119, 121
  - Total Fruit, 123
- Adams County Orchard Photographs, 39, 54, 66
- Advantage of Low Heading, 67
  - Advertising, 93, 103
  - Spraying, 66
  - Storage, 83, 99

B

- Bateman Mfg. Co. (Adv.), 8
- Bendersville National Bank (Adv.), 140
- Biglerville National Bank (Adv.), 108
- Bowker Insecticide Co. (Adv.), 2
- Battlefield Nurseries (Adv.), 130
- Bolster Springs, 110
- By-laws, 19-21
- Boyer, John F., 33-38
- Barrels, 130, 136
  - Cushions, Caps and Circles for, 10
  - Dimensions of, 101
- Basic lag, 51
- Business Methods in Marketing Apples, 91, 140

C

- Committees, List of, 19
  - Duties of, 19, 21
- Cultivating Machinery, 126
- Constitution, 7
- Carbonic Acid Gas Storage, 85
- Cultivation, 36
- Cedar Rust, 24, 27
- Citizens' Trust Co., 129
- Cold Storage, Need of, 83-90
- Compressed Air Sprayers, 24
- Crop Reports, 102, 115, 117, 119, 121, 123
- Concentrated Lime-Sulphur Solution, 63
- Commercial Lime-Sulphur, 6, 2, 20, 122, 124, 128, 141
- Color of Apples, Data on, 47

D

- DuPont de Nemours Powder Co. (Adv.), 114
- Deyo-Macey Engine Co. (Adv.), 116
- Deming Co. (Adv.), 118
- Davis, Franklin & Co. (Adv.), 134
- Dues, 17
- Duties of Officers, 19-21
- Diluting Concentrated Lime-Sulphur Solution, 64
- Discussion following address of—
  - John F. Boyer, 36
  - Dr. J. P. Stewart, 51
  - Clark Allis, 69, 88
  - Prof. U. P. Hedrick, 81
  - W. J. Lewis, 95

E

- Executive Committee—
  - List of, 3
  - Duties of, 21
- Eldon, R. M., 23, 36, 69, 81, 88, 95
- Experimental Orchards, Report on, 35-53
- Educating an Orchard, 66-70
- Eastern Fruit Growers' Association, 99

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F

First National Bank, Gettysburg (Adv.), 134
Field Force Pump Co. (Adv.), 120
Fire Blight, 137
Fancy Fruit, 38, 39, 54, 58, 63, 66, 82
Fulton, Prof. H. R., 26-32
Fruit Districts, 19
Frame, Nat T., 99
Formula for Lime-Sulphur Solution, 63
Fruit Exhibits, Report on, 109
    Adams County Records, 115, 117, 119, 121, 123
    Part at Pittsburg Fruit Show (Illustration), 82
Fertilizers, 14
    For Orchards, 36, 39, 53
    Experiment in Adams County, 52
Fungicide, 2, 6, 20, 122, 124, 128, 141

G

Gould Mfg. Co. (Adv.), 16
Grasselli Chemical Co. (Adv.), 128
Gettysburg National Bank (Adv.), 130
Gettysburg & Harrisburg R. R., (Fruit Shipments Over), 115, 117
Griest, C. S., 36

H

Horticultural Chemical Co. (Adv.), 6
Harrison, J. G. & Sons (Adv.), 4
Hamilton Orchard Heater Co. (Adv.), 132
Hedrick, Prof. U. P., 54-62, 69, 71-82, 89
Houck, P. L., 96
Horticultural Requisites, 141

I

Illustrations—
    Twig Blight of Apples, 26
    Cedar Rust, 28
    Diagonal Pack, 140
    Side View of Boxes, 106
    Apples from Unsprayed Trees, 32
    Advantage of Spraying, 65
    Fine York Imperial Apple Tree, 91
    Packing Adams County Apples, 54
    Picking Adams County York Imperial, 66
    Well Tilled Orchard, 77
    State College Greenhouses, 125
    Well grown Winesap Tree, 49
    Ohio Cold Storage House, 83
    Section of Gravity Brine Storage, 86
    Extent of Tree Roots, 33, 53
    Brine Tank of Cooper Storage System, 87
    Plate of Adams County Apples, 63
    Cluster of Adams County Winter Banana, 71
    Two Methods of Planting, 107
    Basket of Adams County York Imperials, 39
    Dish of Strawberries, 38
    Cluster of Adams County York Imperial, 58
    Low Headed Apple Tree, 143
    Thrifty Orchard in Hagerstown Clay Loam, 41
    Unsprayed Tree Defoliated by Leaf Spot, 29
    Ohio Greenhouse, 127
    Unpruned York Imperial Eight Years Old, 62
    Starting Muskmelons in Hot Bed, 127
    Skinner System of Irrigation, 129
    Adams County Blue Ribbon Fruit at Pittsburg Show, 82
    Stayman Apple, 98

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L

Lafean Apple, Package and Grade Bill, ... 100, 101
Lime-Sulphur—
    Method of making, ... 63
    Strength to use Commercial, ... 64
Lewis, W. J., ... 88, 91-98
Light Draft Harrow Co. (adv.), ... 126

M

Membership—
    Roll of, ... 5, 7, 9, 11, 13, 15
    Constitutional requirement for, ... 17
    Increase in, ... 23
Marketing, ... 92
Mulching, effect of, ... 45
Musselman Canning Co. (adv.), ... 18
Madison Cooper Co. (Adv.), ... 138

O

Officers—
    List of, ... 3
    Consist of, ... 17
    Duties of, ... 19-21
Objects of Association, ... 17
Order of Business, ... 21
Orchard—
    Cultivation of, ... 68
    Orange Rust in, ... 27
Orner, P. S. (Adv.), ... 130

P

Pratt Co., B. G. (Adv.), ... 12
President's Address, ... 23
Pruning, Methods of, ... 67-69, 70
Peach Culture, ... 33-38
Planting, Method of, ... 67, 107

R

Reiter, W. C. (Adv.), ... 110
Read, G. P., ... 110
Report of Fruit Exhibit, ... 109

S

Size of Apples not a True Test of Value, ... 55
Size, Color and Quality in Fruits, ... 54-62
Spray Injury, ... 64
Sherwin-Williams Co. (Adv.), ... 122
Schell, Walter S. (Adv.), ... 22
Symmons Bill, ... 102
Stewart, Dr. J. P., ... 39-53, 63-65, 70
Sprayers, Various Types of, ... 24
Sod Mulch, Tillage, ... 71
    Defined, ... 73
    Advantages of, ... 74
    Effect on Foliage, ... 76
Spraying, Importance of care in, ... 24
    Value of, ... 68
Styles in Fruits, ... 103

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Storage—
    Common, ... 95
    Cold, ... 89
    Cost of, ... 87, 98
    Of Lime-sulphur, ... 64

T

Tillage v. Sod-Mulch, ... 71
    Defined, ... 72
    Object of, ... 73
    Affect of, on keeping in storage, ... 77
    Affect of, on Soil Temperature, ... 79
Trees, Heading of, ... 37, 67
Tipton, W. H. (Adv.), ... 132
Thomson Chemical Co. (Adv.), ... 124
Tilley, John S. (Adv.), ... 112
Tables—
    I. Experimental Orchards, ... 40
    II. Influence of fertilizers on Yield, ... 42
    III. Effect of Fertilizers on Yield, ... 42
    IV. Influence of Cultural Methods and Fertilizers on Yield, ... 44
    V. & VI. Effect of Fertilizer Elements on Yield, Color, Size and Growth, ... 46
    VII. Yield of Fertilizer Experiment, Tyson Orchard, ... 52
    Results of Sod and Tillage on Yield compared, ... 75
Twig Blight, ... 26
Time for thinning and pruning, ... 36, 37

V

Varieties—
    Apples, ... 97
    Peaches, ... 37
Vreeland Chemical Co. (Adv.), ... 20

W

Western Maryland R. R., Shipments over, ... 19, 21
Well Tilled Orchard, ... 77

Y

York Chemical Co. (Adv.), ... 14
York Imperial (Illustrations regarding), ... 39, 58, 62, 66, 99

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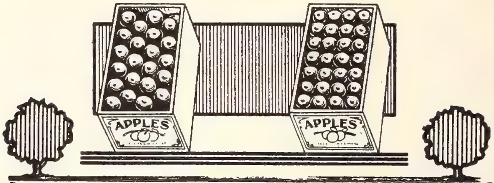

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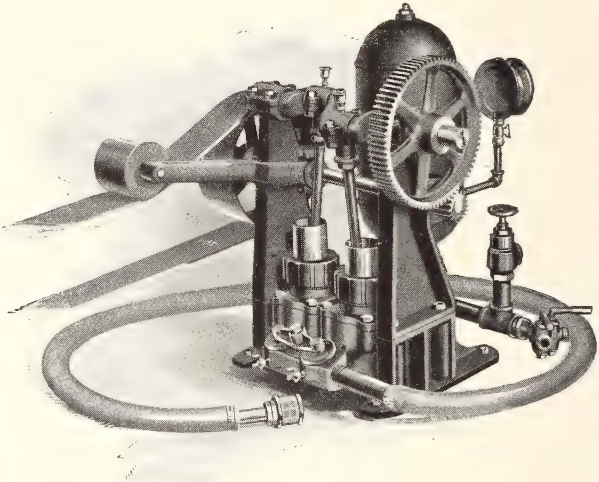

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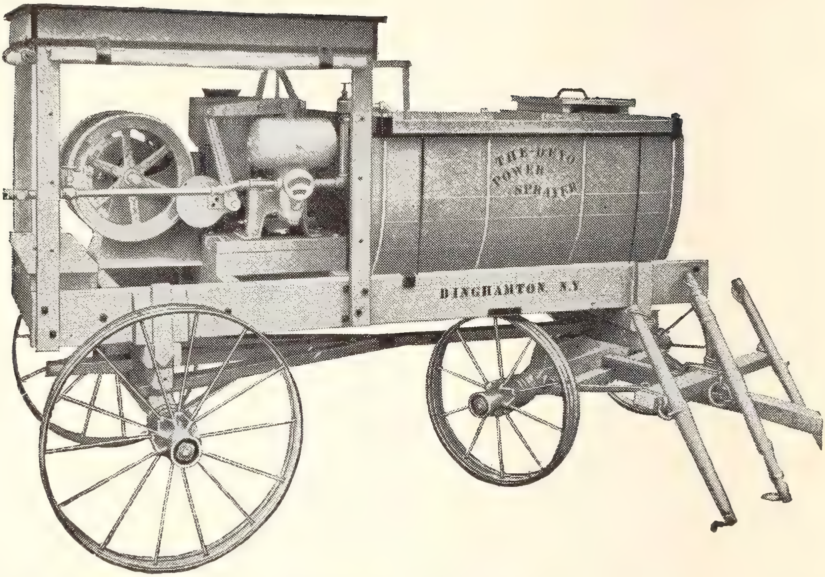
Eppleman, H. C.,	Aspers, Pa.
Estabrook, F. L.,	Athens, Pa.

Finnefrock, Thomas,	Bendersville, Pa.
Fohl, George E.,	Biglerville, Pa.
Fiddler, W. B.,	Aspers, Pa.
Felty, G. B. O.,	Millersville, Pa.
French, Albert,	545 Mountain Avenue, Montclair, N. J.
Griest, C. Arthur,	Guernsey, Pa.
Griest, Mrs. C. A.,	Guernsey, Pa.
Griest, C. S.,	Guernsey, Pa.
Griest, A. W.,	Baltimore, Md.
Griest, Frederic E.,	Philadelphia, Pa.
Griest, G. G.,	30 Church St., N. Y. City.
Griest, Maurice,	105 W. 163d St., N. Y. City
Griest, Chas. J.,	York Springs, Pa.
Garrettson, Frank,	Aspers, Pa.
Garretson, Eli P.,	Biglerville, Pa.
Garretson, Harriet,	Biglerville, Pa.
Garrettson, J. B.,	Aspers, Pa.
Garretson, Robert,	Flora Dale, Pa.
Garrettson, John,	Aspers, Pa.
Garrettson, Eli,	Gettysburg, R. F. D. No. 6, Pa.
Grove, W. E.,	York Springs, Pa.
Gillan, R. J.,	St. Thomas, Pa.
Groupe, Foster C.,	Idaville, Pa.
Gardner, L. M., Jr.,	York Springs, Pa.



With a DEYO POWER SPRAYER

You are READY to spray the day conditions are ripe

¶ No delay tinkering the machine.
¶ No endless adjusting to make it work right
¶ No countless parts to buy and wait for until the vital time to spray has passed.

Deyo Power Sprayer

is always ready, always satisfactory, because it's made right, of best materials, by skilled mechanics, under the personal instruction and direction of Mr. Deyo.

¶ **You, as a Fruit Grower, know that the San Jose Scale is worse this year than ever before.** Make your plans early, therefore, to give your orchard the proper care. No investment pays so well as the money put into a Deyo Power Sprayer.

¶ *Write us to-day and we will send you at once our illustrated booklet telling all about the Deyo Power Sprayer, and give you some facts, in regard to it that are hard for any Grower to get away from.*

DEYO-MACEY ENGINE CO.
BINGHAMPTON, N. Y.

We manufacture nothing but DEYO POWER SPRAYERS and DEYO ENGINES--Engine Sizes 1½ to 16 H.P.

Gochnauer, J. D.,	York Springs, R. F. D., Pa.
Gochnauer, Jacob S.,	Aspers, Pa.
Gracey, Robert,	Newville, Pa.
Gove, Mary E.,	Bendersville, Pa.
Guise, D. H.,	Emmittsburg, Md.

House, O. P.,	Aspers, Pa.
Harris, Meriam,	Bendersville, Pa.
Hoffman, Jas. O.,	Arendtsville, Pa.
Hoffman, E. N.,	Biglerville, Pa.
Hoffman, Daniel,	Aspers, Pa.
Hoffman, George,	Arendtsville, Pa.
Hoffman, Willis,	Biglerville, Pa.
Harshman, U. W.,	Waynesboro, Pa.
Huber, Charles H.,	Gettysburg, Pa.
Hartman, Geo. R.,	Biglerville, Pa.
Hull, D. W.,	Waymart, Pa.
Hummel, P. T.,	Harrisburg, Pa.
Hazard, Willis Hatfield,	West Chester, Pa.
Hershey, C. A.,	McKnightstown, Pa.
Heilman, J. R.,	Palmyra, R. F. D. 2, Pa.
Hertig, John,	Arendtsville, Pa.
Hart, H. V.,	Martinsburg, W. Va.

Jacobs, Daniel C.,	Gettysburg, R. F. D. No. 5, Pa.

Keller, H. M.,	Gettysburg, R. F. D. No. 5, Pa.
Klinefelter, U. S.,	Biglerville, Pa.
Kane, J. A.,	Biglerville, Pa.
Kane, J. Lewis,	Gettysburg, R. F. D. No. 6, Pa.
Knouse, J. A.,	Arendtsville, Pa.
Knouse, David,	Arendtsville, Pa.
Koser, Rev. D. T.,	Arendtsville, Pa.
Koser, G. W.,	Arendtsville, Pa.
Kunkle, John R.,	Gettysburg, Pa.

Longsdorf, C. L.,	Biglerville, Pa.
Lawver, Rufus W.,	Biglerville, Pa.
Lawver, J. Edw.,	Biglerville, Pa.
Longsdorf, Dr. H. H.,	Dickinson, Pa.
Lady, Hiram C.,	Arendtsville, Pa.
Lupp, Reuben,	Biglerville, Pa.
Lau, L. B.,	East Berlin, R. F. D. No. 3, Pa.
Large, Mrs. E. S.,	Orrtanna, Pa.
Large, Miss Katharine,	Orrtanna, Pa.
Lewis, W. J.,	Pittston, Pa.
Lower, Dr. S. E.,	Pittsburgh, Pa.

Michener, Mrs. Chas.,	Bendersville, Pa.
Myers, George P.,	Biglerville, Pa.

¶ It is not only the growing of the fruit that demands your attention, but the manner in which it is packed as well.

Corrugated Caps

White Paper Caps

P.P.P.

G.P. READ.

199 DUANE St., NEW YORK

BRANCH ALBION, N.Y.
MANUFACTURER AND
DEALER IN SUPPLIES
USED BY THE FRUIT
GROWER AND SHIPPER
FOR THE PICKING,
PACKING AND PROTECTING
OF HIS FRUIT.

Cushions

Lace Circles

¶ The use of my goods at the time of packing increases the value of your fruit 10%.

Send for booklet on Fruit Packing Supplies. It is FREE.

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McKay, Geo. H.,	Philadelphia, Pa.
Mayer, Dr. I. H.,	Willow Street, Pa.
Morrison, Mrs. W. S.,	Aspers, Pa.
Miller, John H.,	Aspers, Pa.
Minnich, D. N.,	Chambersburg, Pa.
Minter, Thomas L.,	Biglerville, Pa.
Musselman, C. H.,	Biglerville, Pa.
Musselman, J. Elmer,	Gettysburg, Pa.
Minter, Mrs. D. G.,	Gettysburg, R. F. D. No. 5, Pa.
Myers, Levi M.,	Siddonsburg, Pa.
Miller, Robt. C.,	Gettysburg, Pa.
Miller, E. M.,	Hanover, Pa.
Moyer, Dr. H. B.,	Cape May, N. J.
Mickley, J. W.,	Fairfield, R. F. D., Pa.
Mickley, I. D.,	Cashtown, Pa.
Musser, Will M.,	Lampeter, Pa.
Maloney, W. J.,	Dansville, N. Y.
McCormick, C. E.,	Glenburn, Pa.
Newcomer, Aaron,	Smithburg, Md.
Naylor, H. A.,	Aspers, Pa.
Nissly, Christian L.,	Florin, Pa.
Nissly, Alvin R.,	558 Abbottst'n St., Hanover, Pa.

Oyler, Geo.,	Gettysburg, R. F. D. No. 5, Pa.
Oyler, George C.,	Gettysburg, R. F. D. No. 5, Pa.
Ogden, David,	Aspers, Pa.
Orner, P. S.,	Arendtsville, Pa.

Prickett, Josiah W.,	Biglerville, Pa.
Peters, Z. J.,	Guernsey, Pa.
Peters, H. W.,	Aspers, Pa.
Peters, W. R.,	Aspers, Pa.
Peters, Geo. M.,	Aspers, Pa.
Peters, Curtis,	Biglerville, Pa.
Peters, John N.,	Bendersville, Pa.
Pitzer, Harry C.,	Aspers, Pa.
Patterson, Jas. A.,	Stewartstown, Pa.
Pratt, B. G.,	New York City.

Raffensperger, Chas. E.,	Arendtsville, Pa.
Raffensperger, Roy,	Arendtsville, Pa.
Raffensperger, Harry,	Arendtsville, Pa.
Rice, E. E.,	Aspers, Pa.
Rice, C. E.,	Biglerville, Pa.
Rice, Waybright,	Biglerville, Pa.
Rice, C. S.,	Arendtsville, Pa.
Rice, Luther S.,	Arendtsville, Pa.

What Does Your Spraying Cost?

Spray Material is not the Greatest Cost

¶ Good labor is becoming more scarce and more expensive each year.

¶ Would you like to cut your labor bill in half, and insure better, cleaner trees and fruit? Let us tell you how.

¶ One spray-tank full of "SCALECIDE" will spray as many trees as two spray-tanks full of Lime Sulfur, in each instance spraying until every twig is covered and the trees drip.

¶ The N. Y. Experiment Station reports that 9 gallons of "SCALECIDE" spray has the same covering power as 17 gallons of Lime-Sulfur. We know of an orchard that required 25,000 gallons of Lime-Sulfur in 1911 and was sprayed in 1912 with less than 11,000 gallons of "SCALECIDE" with better results. Don't say you don't believe it until you have made a fair and square test of it.

¶ Suppose that it takes 1-50 gallon barrel of "SCALECIDE" to spray your orchard—what will it cost? What would it cost to do the same work with Lime-Sulfur?

1 barrel "SCALECIDE," making 800 gallons of spray 1 to 15, will cost delivered in Pennsylvania and vicinity -	$25.00	
Cost of labor for applying at 1½c per gallon -	12.00	
		$37.00

It will require 1500 gallons of Lime-Sulfur to spray the same orchard, which will require 3⅓ barrels of the best commercial Lime-

Sulfur 1 to 8, at $4.50 per barrel - -	$15.00	
Labor of applying 1500 gallons of spray at 1½c per gallon - - - - - -	22.50	
		$37.50

which demonstrates that if you pay over $4.50 per barrel for Lime-Sulfur (you cannot make it at home for that), you are paying more than for "SCALECIDE" at $25.00 per barrel.

"Scalecide" Costs More by the Gallon, but Less by the Orchard

¶ No spray is cheap that does not do the work.

¶ The Missouri Experiment Station reports that "SCALECIDE" killed 100% of scale (by count) in five out of seven tests, while Lime-Sulfur failed to do so once in ten tests in the same orchard.

¶ The finest and most productive orchards in the U. S. have never had Lime-Sulfur on them, but "SCALECIDE" has been used exclusively as a Winter wash since planting. We will take pleasure in referring you to them.

B. G. PRATT CO., 50 Church Street, New York City
E. C. TYSON---Pennsylvania Agent---Flora Dale, Pa.

Rice, Oscar C.,	Arendtsville, Pa.
Routzahn, George R.,	Bendersville, Pa.
Rinehart, E. S.,	Mercersburg, Pa.
Rinehart, J. J.,	Smithburg, Md.
Roberts, Arthur,	Gettysburg, R. F. D. No. 5, Pa.
Reist, Henry G.,	110 Avon Road, Schenectady, N. Y.
Reist, Eli G.,	Mt. Joy, Pa.
Repp, Albert T.,	Glassboro, N. J.
Riddlemoser, H. E.,	McKnightstown, Pa.
Roth, John,	Biglerville, Pa.
Rice, Edwin A.,	Arendtsville, Pa.
Rex, Raymond,	Idaville, Pa.
Rhoads, C. A.,	Friedens, Pa.
Stover, Dr. J. G.,	Bendersville, Pa.
Slaybaugh, E. B.,	Aspers, Pa.
Slaybaugh, Elmer,	Aspers, Pa.
Smith, G. Frank,	Aspers, Pa.
Smith, J. H.,	Biglerville, Pa.
Shank, George H.,	Biglerville, Pa.
Sheely, Allen,	Bendersville, Pa.
Sheely, Geo. D.,	New Oxford, Pa.
Shull, Jno. A.,	Tillie, Pa.
Shull, Robt. H.,	Tillie, Pa.
Stoner, C. A.,	Gettysburg, Pa.
Schuchman, G. W.,	Carlisle, Pa.
Spangler, George E.,	Gettysburg, Pa.
Snyder, E. B.,	Jack's Mountain, Pa.
Snyder, Jacob S.,	Idaville, R. F. D., Pa.
Snyder, W. L.,	Bendersville, Pa.
Snyder, L. S.,	York Springs, Pa.
Starner, C. S.,	Aspers, Pa.
Stitzel, J. A.,	Aspers, Pa.
Stauffer, Chas. B.,	Gettysburg, Pa.
Sachs, Edw.,	Biglerville, Pa.
Stock, E. C.,	3610 Clifton Av. Balto. Md.
Strasbaugh, E. F.,	Orrtanna, Pa.
Sheffer, E. Kate,	Boiling Springs, Pa.
Sheely, A. D.,	Arendtsville, Pa.
Smith, J. Russel,	Swarthmore, Pa.
Tyson, Edwin C.,	Flora Dale, Pa.
Tyson, Mrs. M. W.,	Flora Dale, Pa.
Tyson, Chester J.,	Flora Dale, Pa.
Tyson, Mrs. B. H.,	Aspers, Pa.
Tyson, Wm. C.,	Guernsey, Pa.
Tyson, Mrs. M. E.,	Guernsey, Pa.

Feed the Tree!

¶ **Dempwolf's Spring Special Brand** has proven highly effective as a Fertilizer for orchards.

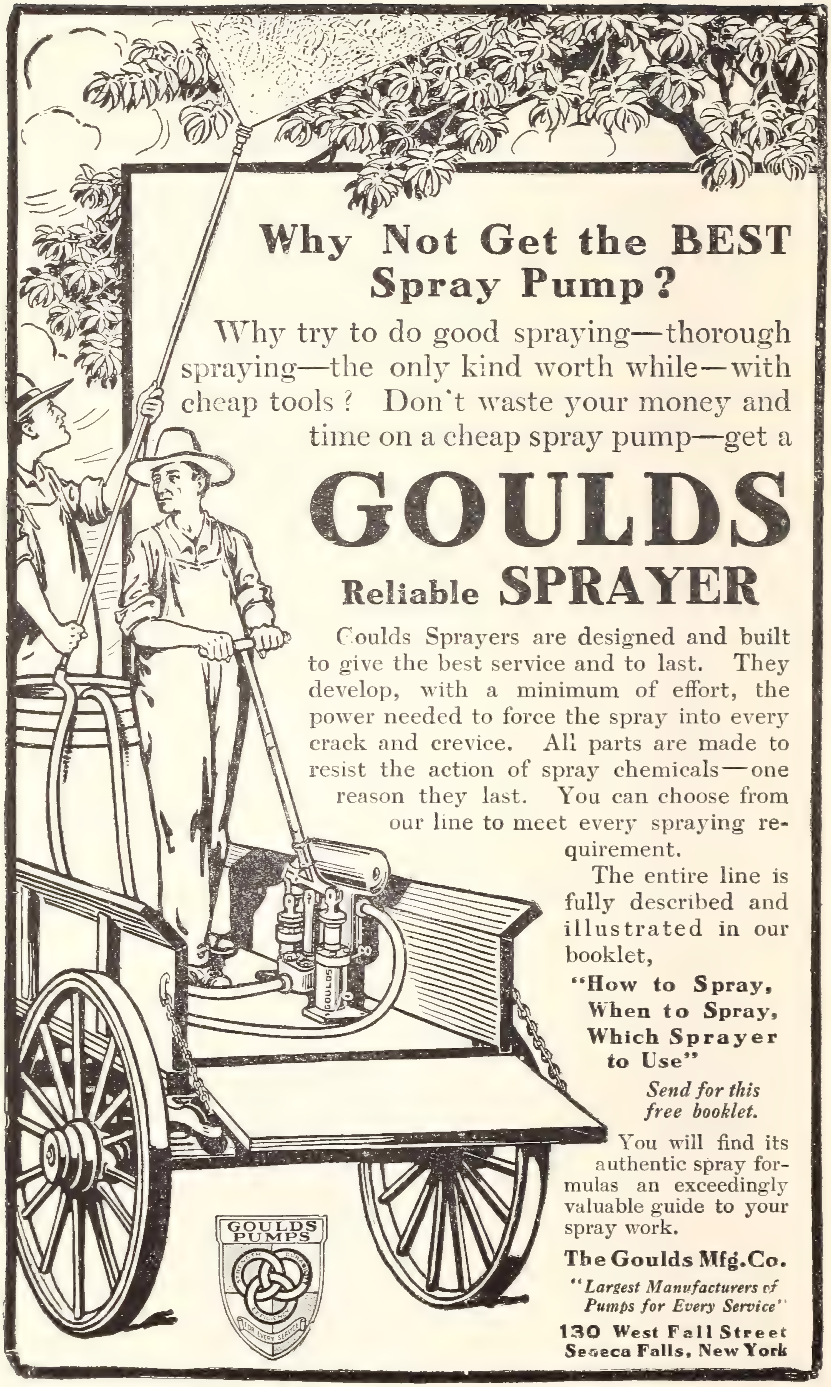
Analysis:		**Formula:**
Ammonia, - -	2%	*Ingredients Used for Ammonia:* Nitrate of Soda. Ground Fish. Dried Ground Blood. High Grade Animal Tankage. Dempwolf's Special Ammonia and Phosphoric Acid Compound.
Available Phosphoric Acid,	7%	*Ingredients Used for Phosphoric Acid:* Dissolved Phosphate. Ground Fish. High Grade Animal Tankage. Dempwolf's Special Ammonia and Phosphoric Acid Compound.
Potash (Soluble in water),	10%	*Ingredients Used for Potash:* Muriate of Potash.

Ask Your Local Agent for this Brand, or write direct to

York Chemical Works

YORK, PENNA.

Tyson, A. R.,	Norristown, Pa.
Taylor, Hanson W.,	Biglerville, Pa.
Taylor, Henry,	Biglerville, Pa.
Trostle, Francis,	York Springs, R. F. D., Pa.
Thomas, Mrs. Dr.,	Gettysburg, Pa.
Taughinbaugh, J. L.,	Hunterstown, Pa.
Ullrich, L. L.,	Biglerville, Pa.
Weidner, A. I,	Arendtsville, Pa.
Wolfe, C. A.,	Aspers, Pa.
Wolfe, Harry,	Aspers, Pa.
Wolf, Dr. W. E.,	Arendtsville, Pa.
Wolf, Charles M.,	York Springs, Pa
Weaver, Mrs. C. M.,	New Oxford, Pa.
Weaver, David,	Biglerville, Pa.
Wilson, B. F.,	Biglerville, Pa.
Weaner, Chas. C.,	Bendersville, Pa.
Weaner, W. C.,	Aspers, Pa.
Wertz, D. M.,	Quincy, Pa.
Wible, R. E.,	Gettysburg, Pa.
Wickersham, Ruth A.,	Bendersville, Pa.
Wickersham, Robt. A.,	Bendersville, Pa.
Wagner, Harry,	Carlisle, Pa.
Wright, Ryland,	Aspers, Pa.
Wright, T. F.,	Aspers, Pa.
Williams, J. L.,	Gettysburg, Pa.
Weigle, H. M.,	Harrisburg, Pa.
Walter, J. C.,	Biglersville, Pa.



Why Not Get the BEST Spray Pump?

Why try to do good spraying—thorough spraying—the only kind worth while—with cheap tools? Don't waste your money and time on a cheap spray pump—get a

GOULDS

Reliable SPRAYER

Goulds Sprayers are designed and built to give the best service and to last. They develop, with a minimum of effort, the power needed to force the spray into every crack and crevice. All parts are made to resist the action of spray chemicals—one reason they last. You can choose from our line to meet every spraying requirement.

The entire line is fully described and illustrated in our booklet,

"How to Spray, When to Spray, Which Sprayer to Use"

Send for this free booklet.

You will find its authentic spray formulas an exceedingly valuable guide to your spray work.

The Goulds Mfg. Co.

"Largest Manufacturers of Pumps for Every Service"

130 West Fall Street
Seneca Falls, New York

CONSTITUTION

PREAMBLE.

Being interested in fruit growing and believing that, by organization, we may materially advance our common interests, we hereby adopt the following Constitution and By- Laws.

ARTICLE I.—*Name.*

This Association shall be known as The Fruit Growers' Association of Adams County.

ARTICLE II.—*Object.*

The object of this Association shall be to encourage the co-operation of the fruit growers of Adams County for the protection and advancement of their common interests.

1st. By securing and disseminating such scientific and practical information as shall promote the general advancement of the fruit growing interests in this county, and shall tend to the improvement of the quality and quantity of our products.

2d. By securing such legislation as may be advantageous, and preventing that which may be detrimental.

3d. By securing such improved facilities in transportation as shall tend to give us more expeditious and economical distribution.

4th. By endeavoring to secure a better and more uniform system of packing and package.

5th. By devising some system of marketing our products which will open up and develop the markets and give to the grower a fair and remunerative return.

6th. And by endeavoring to obtain such improved systems of crop reporting as shall furnish, through co-operation with other similar Associations, accurate information concerning production; thereby enabling the fruit grower to know the exact situation.

ARTICLE III.—*Membership.*

1st. Candidates for membership may be elected by a majority vote of the members present, and upon the payment of $1.00 into the treasury shall be entitled to membership until the next Annual Meeting.

2d. Any member may renew his membership by the payment of annual dues, but upon failure to pay dues within three months after Annual Meeting, shall require re-election.

3d. No member shall receive the benefit of commissions or of co-operative buying by the Association, to an amount greater than $1.00 for the term of one year after election to membership.

ARTICLE IV.—*Dues.*

The annual dues of this Association shall be One Dollar, ($1.00) payable to the treasurer at the meeting immediately preceding the annual meeting, for which the Treasurer shall issue a receipt, this receipt to constitute a certificate of membership for the succeeding year.

ARTICLE V.—*Officers.*

Its officers shall consist of a President, a First, Second, Third, Fourth and Fifth Vice President, a Recording Secretary, a Corresponding Secretary, and a Treasurer, all of whom shall be elected by ballot at each Annual Meeting, to serve for the term of one year or until their successors shall be chosen. These nine (9) elective officers shall constitute an Executive Committee.

MAY THE

NEW YEAR

BRING

A BUMPER
APPLE CROP

MUSSELMAN
CANNING
COMPANY

BIGLERVILLE, PA.

ARTICLE VI.—*Quorum.*

Five (5) members shall constitute a quorum for the transaction of business.

ARTICLE VII.—*Amendments.*

The Constitution and By-Laws of this Association may be amended at any regular meeting by a two-thirds vote of the members present, a notice of the proposed amendment having been presented in writing at a previous regular meeting.

ARTICLE VIII.—*Fruit Districts.*

For the purpose of distributing the work of the Association and extending its scope, the County of Adams shall be divided into the following seven (7) districts: District One, or North District, to consist of Menallen Township; District Two, or West District, to consist of Franklin Township; District Three, or Southwestern District, to consist of Highland, Liberty and Hamiltonban Townships; District Four, or South District, to consist of Cumberland, Freedom and Mt. Joy Townships, and that portion of Straban Township lying south of the Western Maryland Railroad; District Five, or Eastern District, to consist of Germany, Union, Conowaga, Mt. Pleasant, Oxford, Reading, Berwick and Hamilton Townships; District Six, or Northeastern District, to consist of Latimore, Huntingdon and Tyrone Townships; District Seven, or Central District, to consist of Butler Township and that portion of Straban Township lying north of the Western Maryland Railroad.

ARTICLE IX.—*Committees.*

The following five (5) committees shall be appointed annually by the newly-elected Executive Committee and announced at the January meeting, as follows: A committee on programs, a committee on membership, a committee on statistics, a committee on exhibits and a committee on crop reports; each committee shall be composed of one or two members from each of the seven (7) districts of Adams County, as designated in Art. 8. and one or two from each of the Counties of York, Cumberland and Franklin.

BY-LAWS

ARTICLE I.—*Duties of President.*

The President shall preside at all meetings of the Association and have a general supervision of its affairs.

ARTICLE II.—*Duties of Vice Presidents.*

The highest designated Vice President present at any meeting shall preside in the absence of the President; all of the five vice presidents shall serve on the Executive Committee in conjunction with the other elective officers; and, in addition, each vice president shall have special duties as follows:

The First Vice President shall be chairman of the program committee, and be responsible for the preparation of a program for each regular meeting, same to be announced at the preceding meeting.

The Second Vice President shall be chairman of the membership committee, and shall use every effort, personally and through members of his committee, to extend the membership and secure renewals.

The Third Vice President shall be chairman of the committee on statistics, and shall be responsible for the preparation of statistics showing number of orchards in Adams County, and, as far as possible, in York, Cumberland and Franklin Counties, with quantity, age, kind and variety of trees planted therein, for the use of the Association, adding thereto as new orchards are planted or old ones extended.

No Change in Name, Location
or Bank Since 1852

U. Grant Border, Pres.
C. H. Evans, Vice Pres.

T. H. Evans
& Company

218 Light Street
Baltimore, Maryland

Have Made
Apples Their Specialty
For Sixty Years

The Fourth Vice President shall be chairman of the committee on exhibits, and have entire charge of securing fruit for exhibits and displaying same as directed by the Association.

The Fifth Vice President shall be chairman of the committee on crop reports, and have entire charge of collecting and compiling same for use of the Association.

ARTICLE III.—*Duties of Recording Secretary.*

The Recording Secretary shall write the minutes of the meetings of the Association and have charge of its Records and Reports.

ARTICLE IV.—*Duties of Corresponding Secretary.*

The Corresponding Secretary shall conduct the correspondence of the Association and shall receive for so doing his necessary expenses for stationery, postage, etc. He shall also act as Recording Secretary in the absence of that officer.

ARTICLE V.—*Duties of Treasurer.*

The Treasurer shall receive and keep an accurate account of all moneys belonging to the Association, paying out same on an order of the Association, signed by the President. He shall make a report of all receipts and disbursements at the annual meeting or at any time at the request of the Association. He shall mail a notice of dues to all members one week prior to the November meeting, at which time all dues are payable, and shall issue certificates of membership in exchange for all dues received. He shall also keep a roll of members who have complied with Article IV of the Constitution and embody same in his annual report.

ARTICLE VI.—*Duties of the Executive Committee.*

The Executive Committee shall have general supervision of the affairs of the Association, auditing all bills and accounts and carrying out the purposes of the Association.

ARTICLE VII.—*Meetings.*

There shall be a regular meeting of the Association on the second Saturday of each month at 7:30 P. M., unless otherwise ordered. The meeting held in December to be regarded as the Annual Meeting. Special meetings may be convened by the Executive Committee at such time as they may appoint.

ARTICLE VIII.—*Initiation of Officers.*

All new officers shall assume the duties of office at the opening of the meeting immediately following the one at which they were elected, except that the newly-elected Executive Committee shall prepare and announce, at the January meeting, the membership roll of the five (5) committees specified in Art. 9, and the chairman of program committee shall prepare a program for the February meeting and announce same at the January meeting.

ARTICLE IX.—*Order of Business.*

1st. Reading of minutes of previous meeting.
2d. Nominations and elections.
3d. Reports of committees.
4th. Deferred business.
5th. Communications.
6th. New business.
7th. Discussion of questions.

HOW ABOUT IT?

¶ Is your SPRAYER unreliable --- does it break down when you need it most?

¶ Are you always repairing or replacing small parts?

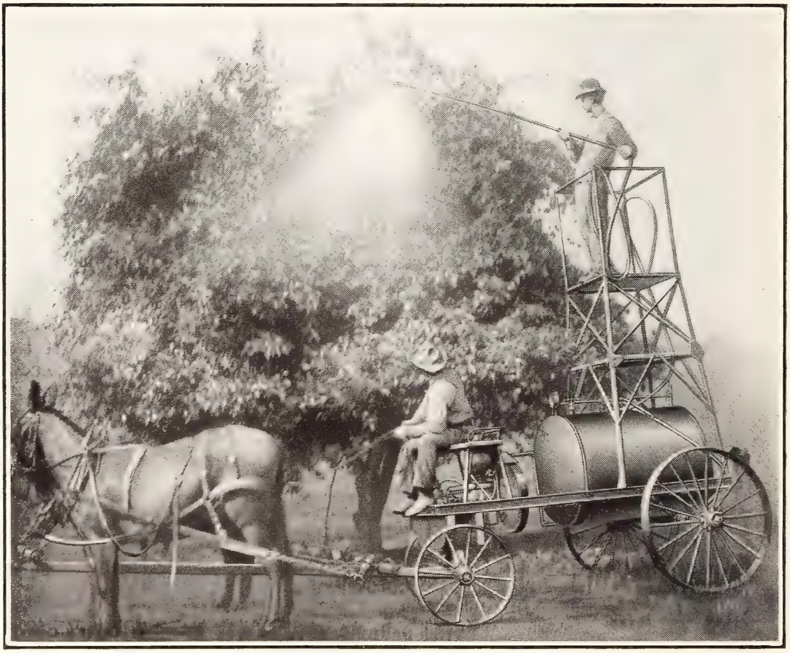
¶ Does your engine refuse to start?

¶ Is your spray fine and penetrating---your agitation perfect?

¶ In short are you PERFECTLY SATISFIED with your Sprayer?

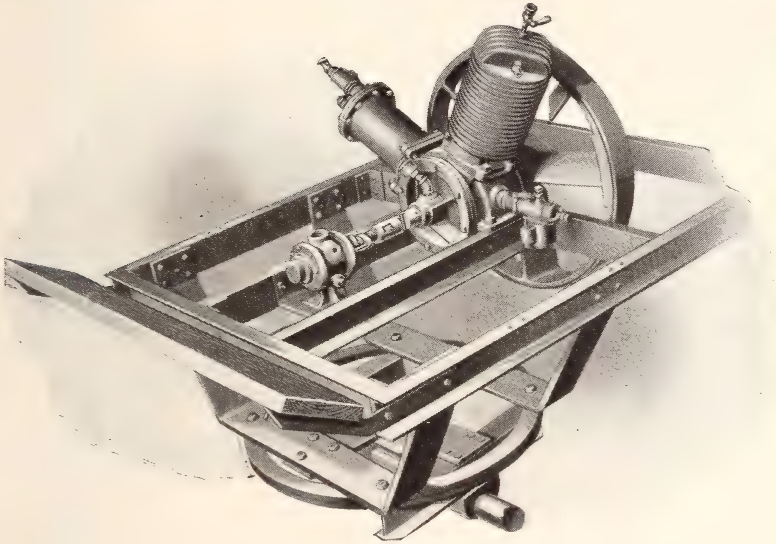
IF NOT---Investigate the

AIR-TIGHT SPRAYER



200 GALLON SPRAYER—ONE MAN AT TREE BEHIND

SIMPLE---ISN'T IT?



Complete Power Plant

AIR TIGHT SPRAYER

¶ Only SEVEN moving parts.

¶ A thousand LESS parts than the average Sprayer.

¶ All steel construction.

¶ Two-cycle air cooled engine, develops TWICE the power required.

¶ Write for descriptive catalogue.

AIR-TIGHT STEEL TANK COMPANY

PITTSBURGH, PA.

E. C. TYSON, Gen'l Agt., FLORA DALE, PA.

“Keystone Farm Right” Dynamite

Should be used by

PROGRESSIVE ORCHARDISTS

It advances tree growth from one to two years, over old planting methods.

Mellows the Soil.
Destroys Harmful Insect Life.
Conserves Moisture Over Drouth Periods.
Loosens up Soil Around Old Trees, affording greater root expansion, thus bringing orchard back to normal bearing.

“Keystone Farm Right” Dynamite

is valuable in Removing Stumps and Boulders, Breaking up Hardpan and Subsoil, Digging Post Holes and Ditches, Draining Wet and Marshy Land.

⁂

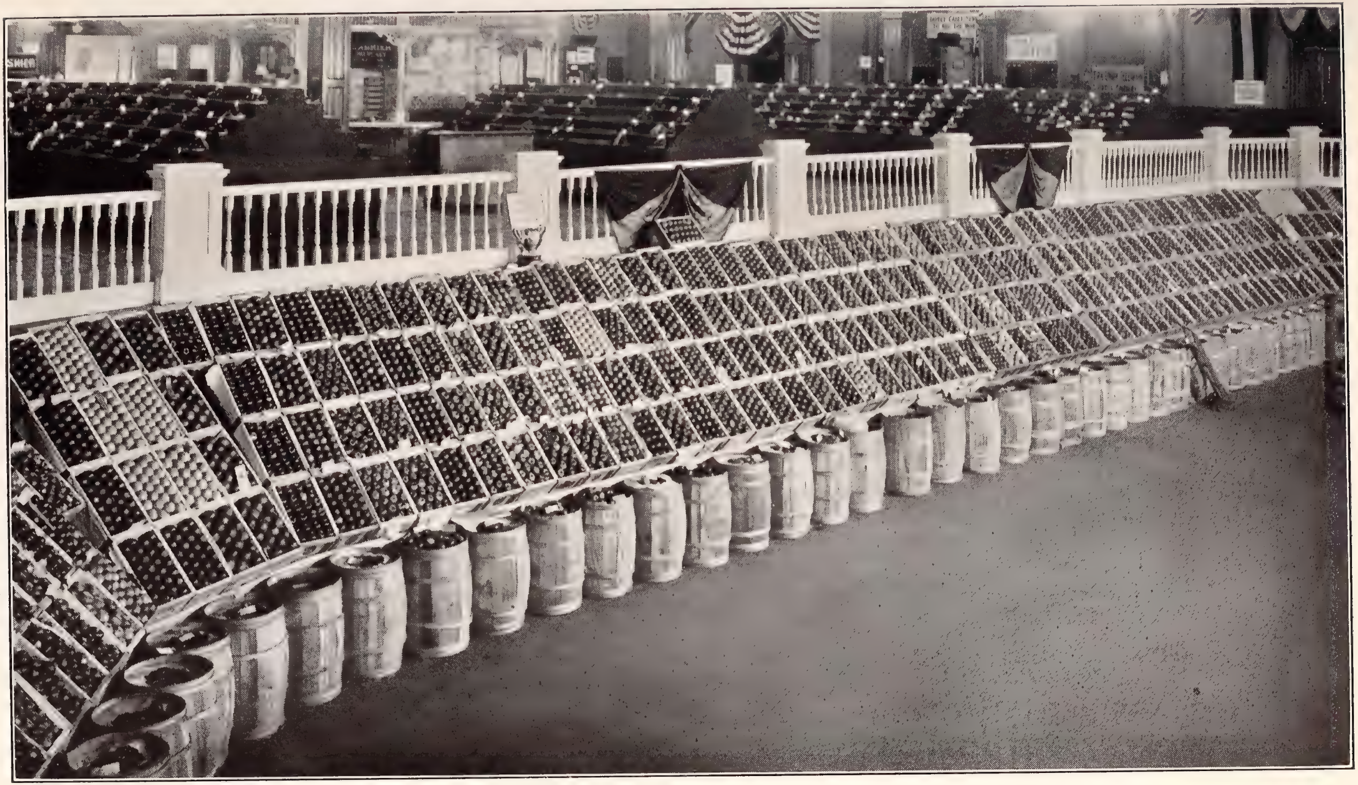
Write for Illustrated Booklet, ***“Farming with Dynamite”***

Keystone National Powder Co.

EMPORIUM, PA.

SOLD IN ADAMS COUNTY BY

Lower Bros.	**R. L. Nesbit & Co.**	**Basehoar & Mehring**
Table Rock	Dillsburg	Littlestown



Adams County Fruit at the Pittsburgh Show.

PROCEEDINGS

OF THE

EIGHTH ANNUAL CONVENTION

OF THE

FRUIT GROWERS ASSOCIATION

OF

ADAMS COUNTY, PA.

The Eighth Annual Convention was called to order by the President, Robert M. Eldon, at 2:00 p. m., Wednesday, December 18, 1912, in Fruit Growers' Hall, Bendersville, Pa.

The convention was opened with prayer by the Rev. D. T. Koser.

Following a few well chosen words of welcome by the President, the program was proceeded with as follows:

PEACHES.

PROF. F. N. FAGAN, *Ass't Professor of Horticulture, Pennsylvania State College.*

I wish to sound a warning note, not that I believe it myself, but the press and public at large are inclined to believe it—that is that there is, or rather might be an over production of apples. We read nearly every day of some large planting of this fruit and the talk is that when all their young trees come into bearing, the ones just planted and the ones that have been planted within the past five or ten years, that there will not be enough people in the United States to use the fruit. That may hold good if people believe their own township is the whole United States, but the facts are that many families of ordinary means, in our large cities, cannot afford apples at the prices they must pay each year to get them. So please understand that I do not take much stock in the over production idea of the apple. But I do know there is, on an average, an under production of peaches. In many localities, we find not enough production of this good fruit to supply the wants of the usual housewife, not to mention the wants of the village, borough, town and city. I believe I know what some of you are thinking,—"We haven't the soil or location to produce peaches." Am I right. Again, you may say we will let Michigan, West York State, Northeast Pennsylvania and Northern Ohio ship us our late peaches for canning and the South Atlantic States and South Central Mississippi valley ship us our early dessert peaches. Well, let the above sections ship us their products and still you will not have enough. You can compete with them and to confirm this statement, talk with your local dealers and grocerymen, and see if they don't tell you that home grown peaches will bring a better price and also that they would rather handle them.

Now, as to soil for peaches, we have been taught that peaches were very exacting as to soils. This teaching is all right but I am of the opinion that it has been carried to the extreme. The very habit and nature of the peach root tends to teach the above. Peach roots are very fibrous, the fibrous roots being more abundant than the stocky heavy ones, indicating as we study tree roots, that the peach prefers a loose soil, and popular opinion has tied this fact to a light, sandy soil. When I speak of light soil, I mean light soil as we speak of it on the farm. As a matter of fact, our loams and clayey loams and even clays can be made very light to handle and also pliable, if we install an abundance of organic matter into it, and on such soils the roots of the peach will be able to develop and obtain plant food, and grow. If one has a clay or loam (a heavy soil) and should desire to grow peaches on it, he should work it well, add manure, and plow under some form of green manuring crops before planting the peaches. Do this before you plant, because it may take you two, three or even four years to fit such soil for peaches. Remember the presence of plenty of organic matter is of great importance.

Now, for the exact location for this planting. I learn that in the mountainous sections of southern Pennsylvania, and eastern and central Pennsylvania, that late spring frosts occur very seldom, provided the elevation is above the surrounding neighborhood. This item is as important as organic matter to the soil. Have good air drainage to protect your trees from spring frosts. It is late spring frost that gets the peach crop more than the low temperature in the dormant season. Peaches have stood a 17 degree below zero temperature without injuring the buds. A tree must be dormant and should have hardened its wood well and in good season to stand such temperatures. Nevertheless, they have stood it and will stand it again too.

The stock you plant, in a general way regardless of variety, I will say should be one year old budded stocks, from a nursery company that will be glad to have you visit their blocks of trees, and select at digging time the stock you want. You may have to pay a little extra for this stock, but remember, the first cost is the best money you will ever spend. Get good trees that have made enough growth in one season to convince you that these trees have established themselves well upon their own roots. Don't select the largest tree, not the smallest, but the average sized one. Let us say about one-half to five-eighth inch trees. And in regard to this nursery tree, insist that the tree is allowed to ripen its wood well.

Planting time I believe should be in the spring before the growth starts in nature around us; use nature as a guide. The tree roots should be pruned to the extent that all broken and mashed or dried-out roots are not put into the ground. Very often together with the pruning, that lifting the tree from the nursery does, and the pruning away of injured roots, one will find that most of the fibrous roots that you were so proud of when you saw the tree lifted, will have disappeared. Don't discard it, for the tree will come along all right. Plant the tree in the ground about the depth or a little lower than it stood in the nursery, which will be indicated by the different color of the bark above the ground and that below. In setting the tree, firm the soil *well* around the roots —get down on all fours if necessary and firm the soil, by hand, allowing no air pockets to form under the roots. And don't be all day at this planting job either. Roots are not meant to be exposed to sunlight and air, so don't try to start something new with nature. She will not stand for such tricks of mankind.

Now, as to planting distances, I have noted that at bearing age the trees fill up the surface of an acre very completely when planted twenty feet each way, which will give about one hundred and twenty-four trees per acre, or planted on the corners of a twenty foot square, which will give you one hundred and eight trees to the acre.

The pruning of the young peach is very important and should be done at once after planting in the Spring. If the young tree is not too large and has not branched too much, the cutting back to a wisp or single stock, will be about right, since you take away with this cutting all possible chance of the skeleton branches or head of the tree from coming out any higher than this cut which generally is made about eighteen inches to two feet above the surface of the ground. Some cutting-back or pruning is necessary to even up the unbalanced condition of the tree-top with its root system, which has been badly disturbed by the loss of roots in the process of lifting, and then the root pruning. Remember right here that nature balanced the roots with tree tops, and we cannot unbalance nature without something unusual following. In this pruning, plant both feet solid on two sides of the tree so your weight will help hold the tree solid in the ground and make your cuts clean with a good sharp big handled knife. If the tree is large and has made some branch growth below the two foot height save them, at least, the ones you want and cut back the branches to about half their length and to an outside bud. Remember, in selecting skeleton branches to keep them far enough apart (three to four branches are enough) and keep them as far apart as you possibly can, and at the same time, pointing out into the space you expect to have filled with tops and peaches, later on. During the next two years practice cutting back each skeleton branch in early spring while the tree is still dormant, to the extent of taking out a third or even a half of the growth the tree made the season before. Some think this practice retards bearing, but while there are some experiments, I believe being conducted aiming at this point I am unable to say what such pruning will do, other than to cause good stocky skeleton branches to develop with good diameter and strength enough to hold up the future crops of fruit. I cannot help but believe, when I see such methods followed, producing good strong branches, and at the same time bearing as much fruit as a small tree three years old can stand under, that it is not such a bad practice after all. If that sounds too "fairy-like", I will add two more years and say that under such methods of pruning (and by the way, with no better location and soil than thousands of Pennsylvania farms have) one grower cleared a little over, as he said, "$5,000.00 off of three thousand trees, five years old." Not so bad when we consider that at the age of three or four years, combined, the same trees had paid for the thirty acres, and their own expenses, besides.

As to culture, in brief, I'll say cultivate the peach orchard, not just once, but cultivate it as a garden and use some form of cover crop to protect the soil and tree roots in the winter. I am beginning to believe that deep freezing of the soil is as injurious to the tree and future crops as is late frost injury to the bud and currant crop. The cover crop will also give us a chance to return to the soil some organic and humus material. The cover crop may be a non legume, such as barley, even rye or a good crop of weeds. It might also be a legume if one believed that the trees were not receiving enough nitrogen. I do know of clover being used between every other row in the orchard and allowed to stand two years while the alternate rows were cultivated two years.

This subject brings up the question of adding plant food to the peach orchard. The addition of plant food to ordinary every-day farm crops is very common, but some how or other, a large number of people believed trees would do all right without plant food and were not demanding food as other crops. I wish, here, to use the idea of Professor Green of Wooster, Ohio, Experiment Station, in one of his reports on the peach section of Ohio.

"The grape industry having failed, for no other apparent reason than the lack of plant food to keep the vines alive, grape vines were taken out and immediately replaced by peach trees. During all this time, continued cultivation was given the land without the addition of any form of organic matter. Large crops of peaches were harvested and the trees began to decline the same as did the grapes. During all these years, no plant food had ever been returned to the soil and by the help of the Experiment Station, the growers began to realize they would have to add some food to the soil or go out of business. So they began adding manure, cover crops and commercial fertilizers and under such treatment, the trees gradually regained their strength and today, it is a highly specialized peach section."

I do not wish to go into the varieties of peaches or the details of spraying. This information can be had in bulletin form from our different State Experiment Stations. I do wish to bring out the point that we should not allow our trees to bear more than they can hold up nicely. In other words, use no props but practice thinning. When the peaches are about the size of blue damson plums, thin them down to about five or six inches apart on the branch. This practice will pay you big. If you are skeptical, try this on a few trees this coming season.

Discussion.

Mr. Bassett. How about diseases?

Prof. Fagan. I have said nothing in regard to disease and disease control, but I want to name the diseases that are apt to be troublesome. In the first place, if peach yellows has entered into your orchard, it will need close attention. Another disease that you will have to fight will be peach leaf curl. Another disease that you are apt to find in nursery stock is crown gall. If you find crown gall in peach trees, do not plant them, for the simple reason that they will never amount to very much. Some nurserymen say that it will not hurt peaches or apples.

R. A. Wickersham. Do any nurseries have crown gall in peach trees?

Prof. Fagan. Yes, lots of them.

R. A. Wickersham. Where?

Prof. Fagan. All through Ohio there is lots of crown gall on peaches. Crown gall on the peach does not look quite like it does on the apple. It is not the white slimy knot that is often present at the union of two roots.

R. A. Wickersham. Is crown gall found in any other states?

Prof. Fagan. I have thrown out crown gall trees from adjoining states. Ohio has it, West Virginia has it, Virginia has it, Indiana has it, Michigan has it, and Pennsylvana will have it. If you buy nursery stock infected with crown gall, do not accept it. I would not plant it.

Mr. Bassett. How about "Little Peach"?

Prof. Fagan. "Little Peach" is a disease that will play havoc if it enters. I understand that there is some little peach in Pennsylvania. Little peach and peach yellows are diseases that we do not know much about. A man that will find an absolute cure for peach yellows other than cutting down the tree, would make an immense fortune. The fact that yellows will destroy your trees means that you must give them accurate care when the yellows shows up. It is improperly named. The first conditions do not show up in any form of a yellow tint, it shows up in the premature ripening of the fruit. It may show up on one limb. If it ripens its fruit in that way, take your knife and cut across the cheek and if you see a streaking of red across the peach, taste that peach and you will think it is the worst peach you ever tasted. And if you do find such things, then look at the root. If you do not find borers there, then examine the bark and see if there are any bark beetles feeding on the bark. if it is not so infested, do away with it. The best thing you can do is to cut that tree out and burn it, even though it has a nice crop of peaches on it. I will just tell you what two men I know of have done. There used to be quite a peach section in Columbiana County, O. It was noted for peaches. The yellows entered there and the advice that some of the experienced fruit people in counties further east gave was that whenever you see such signs, cut out the trees and burn them. That was two years ago. One man has followed the practice of cutting out every tree that showed any signs of yellows, and the following year, after he had taken out the stump and hauled in some fresh ground, he planted another peach tree, and at the present time that orchard looks as good as any peach orchard that you will see.

On one side of the fence is a perfectly healthy, normal peach orchard. On the other side of the fence is an orchard almost ruined with the yellows. The only way you can account for it is that the one man has cut out the trees as the yellows appeared, taking out the stump and planting another tree, and the other man neglected it.

R. A. Wickersham. Is there any certainty that the cutting out does any good?

Prof. Fagan. There is absolutely no certainty at all, but cutting out will check the disease.

Question. How about crimson clover as a cover crop?

Prof. Fagan. Crimson clover lends a good deal of nitrogen and I see no objection to using it. Here in Pennsylvania it might add too much nitrogen for you.

R. M. Eldon. How about early Spring cultivation? Could that clover be destroyed without plowing it?

Prof. Fagan. Crimson clover would be pretty hard to destroy without plowing. You might destroy it by plowing it with a heavy disc.

Question. Do you think producing too much nitrogen in the soil would be apt to produce yellows?

Prof. Fagan. You can unbalance a tree just as readily with plant food as you can unbalance a steer in the feeding proposition, and you might get too much nitrogen. I do not think so, however.

Question. In the way of commercial fertilizers to feed the orchard, what would you use? What kinds, in what proportion and how much?

Prof. Fagan. I believe you have Prof. Stewart on the program, and as he has been working among fertilizers, perhaps he will answer that question. Phosphoric acid 16% pure is all right. I would add actual nitrate of soda to the peach orchard somewhere around 15 lbs. Not over that.

W. E. Grove. Do you think it practicable to do all your shipping by express?

Prof. Fagan. It is according to how much the basket is going to cost you to get it into the market. It would probably be 12 cts. to 20 cts. per basket. If 12 cts. I would say that you would make money at that.

Mr. Newcomer. Do the little hair-like roots on peach trees indicate crown gall?

Prof. Fagan. Not at all. The hair-like roots on peach trees are no indication of crown gall. When you get peach trees some varieties are that way and others have nice, large roots, but some varieties have too many of those fine, fibrous roots.

Question. Do you object to that kind, or do you prefer it to others that are a little larger?

Prof. Fagan. Not at all. We would trim off the other roots to a few straight roots, and then plant them. Those small roots will die anyway when they are put in the ground.

Question. Professor, do you think extreme cold winters and extremely hot summers have anything to do with bringing on peach yellows?

Prof. Fagan. No, I do not think it has anything to do with it. A weakened condition of the tree subjects it to any form of insect injury or disease injury. That is the only way that a hard winter or a hot summer would have any effect on the presence of such diseases.

We generally believed that peach trees were short-lived. Some of them will live to be 25 or 30 years old and still are good. We do not care how old a tree is, so that it brings in the peaches, that is what we are looking for.

Question No. 14. Wanted—Experience of a fruit grower who has used barnyard manure freely on peaches?

Prof. Fagan. I have known of barnyard manure being used to good advantage in the bearing peach orchard. A winter dressing of about five tons to the acre annually has been followed by consecutive crops of peaches and I believe it to be a good thing.

Question No. 15. How can we prevent rot of peaches?

Prof. Fagan. You can prevent rot in peaches, first by good pruning, getting all the benefit from sunlight possible. Then spray with self-boiled lime sulphur. (See Pennsylvania Experiment Station bulletin, entitled "Peaches for Pennsylvania", by

Jno. P. Stewart, or U. S. Department of Agriculture, Farmer's Bulletin No. 440).

Question No. 16. Will it pay to use orchard heaters in this county?

Prof. Fagan. I am unable to say whether it will pay to use orchard heaters in Adams County or not. All I can say is to experiment if you have losses in crops coming from late spring frosts.

Question No. 17. Does it impair vitality of young peach trees to store in cellar over winter?

Prof. Fagan. It does not injure the vitality of young peach trees to store them in a good cellar over winter.

Question No. 19. Does any grower with personal experience favor planting peach fillers in apple orchard?

Prof. Fagan. I have seen successful crops of peaches for a few years, as fillers in the apple orchard. If a man has the nerve to cut out the filler at the proper time, he will have received something from the orchard in advance of the apple crop. If soil conditions are all right for peaches, I say grow them in the apple orchard.

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ESSENTIALS IN SPRAYING.

(C. E. Bassett, Fennville, Michigan.)

In the first place, the mixing station deserves considerable more attention than most fruit growers give it. If this is not complete and convenient in arrangement, valuable time is lost, the spray may not be mixed properly and various other difficulties arise. I think one of the best mixing stations I ever saw was designed to make Bordeaux for a fifty-five acre vineyard of grapes. A storage tank that held thirty-four barrels was mounted upon a tower eight feet high. A gasoline engine in a little shanty beneath the tank filled it with water. A well built platform upon which were placed the stock solution barrels was about six feet above the ground and five feet below the bottom of the storage tank. A two inch hose was used to transfer the water from the storage tank to the two dilution barrels. Each of these had a one and one-half inch faucet or valve which were caused to empty at the same time into a trough which, in turn, emptied into the strainer, placed in a hole in the top of the spray tank. While the dilute copper sulphate and dilute lime were passing down the trough, the poison was poured in.

To my mind, a better arrangement could not possibly be made. With stock solutions of both lime and vitrol handy, and with the poison within easy reach, the owner could prepare and load one hundred gallons of Bordeaux in eight minutes. The only change necessary to adapt this to any sized sprayer would be to change the size of the dilution tanks. In all cases the dilution tanks should have a capacity of, at least, one-half of the spraying tank. For larger orchards perhaps a fifty barrel storage tank would be better, especially if you depend upon a windmill for pumping water.

If you make lime and sulphur, this arrangement can be modified so that the boiler which furnishes the steam for boiling the mixture can pump the water into the storage tank. The steam can also be used to dissolve the vitrol, if you prefer to do that way rather than keep a stock solution. I have seen sixteen pounds of vitrol dissolved by steam in three minutes.

The gasoline engine has been so much improved of late, is so inexpensive to operate, and requires so little attention, that its use as a power in spraying is greatly increasing. The horizontal air cooled engine is preferred by most orchardists as it is considerably lighter than the water cooled engine, because it dispenses with the cooling tank. Which ever style,—air cooled or water cooled engine is used, I think it is best to have from two to two and one-half horse power. A less powerful engine is more apt to be overloaded, will not do as good work or last so long, and cannot be adapted to so many other uses about the farm. The engine should be able to produce and maintain a pressure of, at least, one hundred seventy-five pounds, and it would be better to have it two hundred pounds. Especially when you are spraying apples just after blooming time and it is necessary to do a thorough job to control codling moth and scab.

The difficulties that arise in the use of the gasoline engine are usually due to weak batteries or gummed up sparking plugs, to the presence of water or dirt in the gasoline, or to an improper proportion of air and gas. These parts should be frequently examined and kept in good condition.

Just what is the best method of coupling up the pump and engine, whether by belt drive or piston drive, is a question in my mind. However, I cannot see any special advantage of either way over the other. Most all power outfits should be provided with a relief valve for the return to the tank of some of the liquid when the pressure becomes too high. Manufacturers now make these so that iron or steel seats and springs can be put in when spraying with lime and sulphur. One firm has the spring on the outside, so that the spray mixture cannot injure it.

The nozzle that seems to give the greatest satisfaction for general use in orchards, both for lime and sulphur and Bordeaux, is the nozzle known as the "Friend Type." It has a large capacity, makes a fine spray and carries a considerable distance. Nearly all firms have a nozzle of this type. The angle nozzle is very handy; by its use the operator can throw the spray in several different directions by simply turning the extension rod. Any nozzle can be made into an angle nozzle by the use of an elbow of thirty to forty degrees.

The bamboo extension rod is to be preferred to the iron gas pipe kind, as they are lighter and not so tiresome to handle. Other accessories, that all well equipped orchard sprayers include, are leather, or rubber drip guards on the extension rods, a good stop cock, and plenty of good three or four ply hose, one-half inch in diameter.

The tower: Every spraying outfit for orchard or park use should be equipped with a tower. This is especially desirable with large apple and pear trees. Without it one cannot possibly do a thorough job. In spraying for the scale, if every spot on each little twig is not covered with lime and sulphur, or other spray used, a few of them will be left to multiply and re-infect the tree and fruit. They seem to have wonderful enduring and reproductive qualities. Also in spraying for the first brood of codling moth and for the scab, up-to-date growers now consider it an essential to get up so that the spray will be deposited in and about every little calyx cup. That is where most all of the early injury is done to the apple. In the pear, the scab does not seem to be so particular as to the point of attack.

Towers should be about six or eight feet above the bed of the wagon. If you can not reach the top of any apple tree you have with such a tower, I advise you to cut off the tree severely. I have seen several instances where such a procedure has given excellent results.

The agitator: I want to say just a word about agitators. No one longer uses the jet agitator in which a portion of the spray stream returns to the tank, except in outfits having an abundance of power. We need all the power we can get to keep up the pressure in the nozzle, and besides, they do not give satisfactory agitation; nor do the bulk-heads in the horizontal half round tanks give the agitation desired for there is not enough movement to the wagon or cart. There are too many hand mechanical agitators in use. They require too much attention which should be given to the spray rod. Some form of automatic mechanical agitator is decidedly better. These may receive their power from a sprocket wheel fastened to a wheel of the wagon, or from an eccentric on a movable axle, or from the engine shaft. They are made to produce various different movements, but I believe that the propeller type excels them all. In this, a shaft runs lengthwise and near the bottom of the tank; upon this are fastened propellers or paddles. The shaft revolves and gives the spray liquid a rotary and upward motion and produces ideal agitation. Properly made, strained and agitated spray liquids should leave only a very small amount of sediment in the tank.

Another point, that should be mentioned that contributes considerably to the facility of spraying, is the cleaning of the spray tank, hose and nozzles with clear water after each day's work to remove all sediment that may have collected. A large amount of the clogging of valves and nozzles can be attributed to the failure to do this. By all means, thoroughly clean out every barrel, tank, valve, or other part of your spraying equipment at the end of the season. Oil the working parts well and put them in a clean place, then when the spraying season opens the next year, everything is ready for business, and no valuable time is lost in scraping, washing, "cussing and discussing."

In conclusion, let me emphasize the necessity of keeping the plungers, couplings, the stop cock, and nozzles all well packed so they will not leak and deluge you as well as the tree. Careful attention given to many of these details saves time and material, makes the sprayer more efficient, takes away a large part of the disagreeableness of spraying and makes it, as I have heard many say, a joy and pleasure, especially when the crop is harvested in the fall.

DUTIES OF CITIZENSHIP.

MR. H. W. COLLINGWOOD, *Editor "The Rural New-Yorker."* (*"The Hope Farm Man."*)

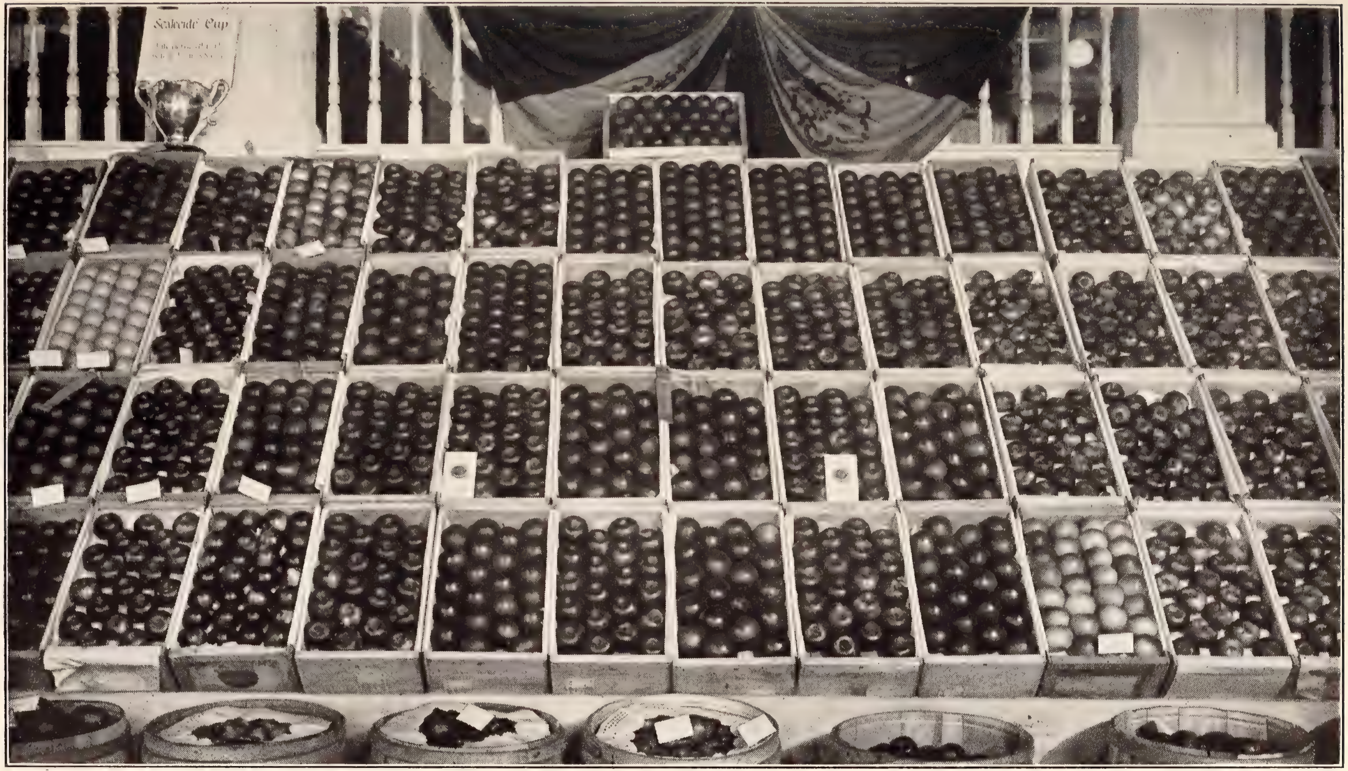
I assume that it is the highest national ambition of every one here that this country may remain a republic, in fact as well as in name, but if this government is to remain a republic, two things must be understood. There must ever be a class of free men so situated in life that they can and will do independent and fearless thinking and acting. Without such a class a republic is impossible. We cannot have such a class unless we can in some way keep alive the small, independent freeholder of land—the farmer. This farmer cannot, and will not exercise his independent and fearless freedom unless he can feel that his business is profitable and has something of the poetry or sentiment of life in it. I wish to build my argument on these propositions. Frankly, I do not see how the republic can endure when our business and our liberties pass into the hands of great corporations, and vast owners of land and property through their political agents. The hope for it lies in maintaining the home of the smaller freeholder.

At the top of a hill in a New England country town lies the village burying ground. It is a bleak and lonely place, yet an honored and hallowed spot. In that graveyard stands a granite stone with this inscription:

JACOB MILLER.

GOD GAVE HIM NEW LIFE, THEREFORE WE HAVE BROUGHT HIM HOME.

That man was the village pauper; the one lazy, shiftless wretch who would not work. If you know anything of the New England people and their character, you will understand how they despised a pauper, and hallowed their dead. A prince could hardly have won a place to lie beside them in their graveyard except through some great moral sacrifice. How then did this pauper come to be there? The war broke out, and Lincoln issued his call for men. This poor, shiftless man felt for the instant something of that thing which leads all men on to some great test of manhood, without which they will not go. That man volunteered and went to the front. He died as a soldier should, and the people at home said that "God had given him new life," and so they brought him and buried him beside their own. What they meant was that in some miraculous way God had shown that man his sublime duty as a citizen; something out of the ordinary routine of life, that he might do his share to preserve this republic as a free government.



The "Best Twenty-Five Boxes," Stayman Winesap, at Pittsburg Show.
"Grown in Adams County."

I shall claim first no one really does his full duty as a citizen without making some sacrifice, and feeling something of sentiment about his work. In a republic, from the very nature of things, every great public benefit must be made up of a thousand little bits of self-denial or personal loss on the part of individuals. It follows as a natural law that if we would get any great abuse or wrong out of public life, a mighty penalty must be paid for it, and you and I and the rest of us must pay our little share. This was so of slavery, and it will be so of other evils which we are fighting to remove from public life. We must *buy* them, pay for them out of our own comfort or prejudice before we can kill them. The sentiment I have mentioned may be expressed in various ways. We may show it in packing a superior box of apples for the real joy of doing it, in making a good farm, in pride in a home, in a dozen ways which come into the ordinary life; in doing things for which we expect only a sentimental or a spiritual reward. For the truth is that no man can do his full duty as a citizen for money value alone, or for the material things which he may hope to get out of life. Duty calls a man or a woman up to higher ground than that, doing things as I have said for the real joy of helping and improving the conditions of life.

You may say that this is hard doctrine, but can you think of any real duty which does not involve some sort of a struggle or moral discipline? If that be so of small duties, how can we hope to escape the larger struggle in the greatest of all patriotic duties, that of keeping our republic so that the common man may have a fair chance? And that is what it amounts to. We owe no patriotic duty to the rich and great, or to those who have obtained more than their share. They owe a duty to us. Our duty lies rather to the plain common man who is denied the rights which should belong to him under a republic. I am not old enough to know it or prove it, but older men have told me that the ten years from '50 to '60 was the golden age of farming in America. There was little aid from science at that time, and less from invention. We never dreamed that we should be called upon to spray or fertilize, or do dozens of things which now seem necessity. It cannot be said that in those days the well-to-do farmer could be as comfortable upon his farm as now. There were no such markets as now, and nothing to compare with our transportation or national wealth; yet for independence of character, love of home, and real glory in our business, that period was, I believe, ahead of this one. I think that on the whole our citizenship was of a higher character. Why? Because at that time our farmers were inspired through their whole daily life by a great moral question regarding labor, and the God-given right of man to labor and to a home of his own. That was what the slavery question meant to most of our farmers. Men could not be free in hand and heart and soul, so long as slave labor or degraded labor was permitted in the same country. These old farmers before the war saw the point quicker than we do that the foundation of all wealth and of real liberty lies at the last analysis in the free human hand. The first practical duty of citizenship was then, as now, to guard the rights of common labor, and this cannot be done successfully through any selfish material movement for personal gain.

If you will stop and think for a moment, you will see that every battle in the world's history which has led to a real reform has been started in the country and carried on by plain country workmen. These things come out of the hills and the silent places where men have time for thought, and where they brood over the injustice of society. From Moses to Lincoln the leaders in this movement have been mostly farmers, or else farm bred men, who carried into other work this rankling injustice which would make the labor of the human hand inferior.

If you look at him fairly, Moses will rank as a model for good citizenship. I have often tried to picture in my mind that wonderful scene where he stood before the Egyptian king. I can see the listless king upon his throne with the gang of fawning parasites and politicians around him. What a hopeless place apparently for a plain man or farmer to enter, yet all at once that crowd of sneering hangers-on parts as though someone had driven a mighty cleaver through it. A plain man strides through the opening and stands before the astonished king. And such a man! He was a farmer, tanned by the sun and wind of the desert, clad in rough skins, staff in hand. Had he been alone he would have been laughed out of the room, if not torn apart. Yet no man dared touch him, and he could look the king in the eye and say with authority *"Let my people go."* He was not alone, because invisible companions stood there at his side. They had come with him out of the desert, over the mountains and through the rivers, to stand there with him and silence that throng. These companions were the courage and the faith which God puts into the hearts of those who honestly try to do their duty.

Perhaps you will say that I pay too much attention to this side of the case. Why do I not spend my time giving specific direction as to what a man may do? No, for it is the foundation of it all. I watched for three years the erection of a great building in New York. For eighteen months there was nothing but a great hole in the ground, with a high fence around it. It seemed as if the builders were making no progress at all, and the public began to sneer and laugh at them. Yet what they were doing was the most important thing of all, and that was to dig down and down until they could lay the foundation of that great building solidly upon a rock. In like manner it will be as I believe hopeless to take up the real duties of citizenship until we can in some way understand and recognize that our work is to be part of a genuine moral crusade.

But granting that this is so, what is the need of any such element in public life? We are told that the country is prospering, and that conditions are as good as they ever have been. Who tells you this? Probably those who have the advantage in some way over what I have called the plain rights of free labor, or else it will be those who have stopped growing, and thus do not care. An old soldier who fought at Gettysburg told me what he was thinking of at the crisis of that battle. Those of you who live here can picture the scene far better than I can. This man told me that he stood with his regiment waiting for the long irregular line of Confederate soldiers coming across the valley at a charge. Had that great line broken through it would have swept on to Philadelphia. If it were beaten back, the tide could never rise again. The guns above him were roaring, and this man, waiting for the shock, thought out the cause of it all. The night before he started for the war his old father, a lame man, who could not go to war, back on a New England farm had told him this:

"John, this war is at bottom an industrial conflict to see whether this nation is to be ruled by plain hand working people, or by an aristocracy of some sort. Probably not more than ten or fifteen percent. of the Southern people are really slave holders, but this small proportion has created a monopoly of political power. This war is to settle the question, shall the plain working people rule, or shall there be a government of the aristocracy which our ancestors ran away from?"

This man said he heard that above the roar of the guns, and when at last the tide went back he felt that his children and his children's children were to have forever the free and fair chance of plain manhood.

"Well," I said, "you earned it for them."

"No, I was mistaken. All we won that day was the chance to gain true freedom, but not freedom itself, because freedom is a growth; it cannot stand still. It goes up or down and we will go down into the hands of the ruling classes unless those for whom it is designed, and who pray for it, are willing to give a part of their lives in order that it may live. We nearly threw away our chance because we did not watch it, and because we could not make our children understand just what citizenship means. The glory of what we had done overpowered us. We lived in it for years, and while we lived in this fool's paradise, silent, sleepless and strong forces were quietly at work with graft, special privilege and "joker" legislation, gathering the power in their hands. They have bought that most precious thing in life—manhood, until we have an aristocracy and power more dangerous to free labor and harder to fight than the old slave holding aristocracy. That was localized, and an entire section could be aroused against it. The new industrial aristocracy enters into every township of the country. We let it get by us when we substituted the glory worship of the old flag for our plain hard duty, and we were not able to make our boys understand it as we did."

Now at heart this old soldier is right. There is no man here who will deny that gigantic evils have grown up in our country through graft, special privilege and corrupt legislation. No one can deny that this evil bites down to the very heart of our form of government, because it takes power away from the small freeholder of land. No one can deny that we men of middle age and older have let this thing get past us, while we neglected the real duties of citizenship. No one can deny that in some way we have, up to this year, somehow found ourselves unable to make our young men see as we did just what was coming. The last campaign for the first time in forty years put a real moral issue into public life. That was essentially what it meant, and the response to it justifies what I have claimed about the need of a sentiment in public life. We know that the future of this country, all we have and all that we cherish, lies in the hands of children and younger men and women. Some of you who are rich and think you are great, may say that the future of Pennsylvania lies in the great vaults of Philadelphia, in the great iron foundries of Pittsburgh, in your coal mines, or even in the orchards on your hillsides. You are wrong. It lies in the hands of little children who are playing to-day on your streets or on your farm, and the childhood which these children enjoy will determine the future of your republic. For *they are the nation,* and put into a sentence, the supreme duty of grown up men and women is to see that every child has the God given right to a fair childhood, and that every young man and every young woman has the God given right to labor with self-respect and independence. The first great duty of citizenship therefore is one of understanding. My friend the old soldier said he could not make the next generation following him understand. Let us fairly comprehend why.

Emerson remains the great American philosopher, because he fired many short sentences at the truth, and usually hit the bull's eye. He puts our thought into a few words. *"Manual labor is the study of the external world. The advantage of riches remains with him who procured them, and not with the heir."* When a man starts with nothing and obtains a competence, he becomes unconsciously the master of it. The property may be money, land, experience or reputation, but the man who acquires it knows the value of every dollar or every atom of it, because he has weighed and sampled it drop by drop of his blood and sweat. And thus it becomes his slave, but when he turns it over to his untrained son, what was the slave of the father becomes the master of the boy. The problem for each generation as one follows another along the avenue of the years is this old problem of taking the slave of the father as a master, conquering it by character and toil, and making it in turn a slave. That is the whole story of historical development. As I read old history, it seems to me one long, monotonous record of building up great cities which prospered for a time only to be pulled down when finally the time came when the son was unable to conquer and dominate the slave of his father. Rome, Carthage, Athens, all rose to power over the dead body of that thing which we still call "personal freedom," and which lies with the small freeholder. These cities conquered country provinces and made them pay tribute. Their entire scheme was one of developing city and town. They never improved the agriculture of any province, but drew the best blood away from it and made the production of food a work for menials. On this false basis the city rose to splendor and power, until finally it was always pulled down. And who pulled it down? Men who came out of the star-lit deserts; men who wandered out of the frozen north, where for centuries they had brooded over their wrong and hoarded in their hearts that spirit of home and of freedom which should ever remain as a part of the nature of the small freeholder of land. For in every age, and with every race of men, it is this man with the small parcel of land which he controls who has finally kept alive the world's liberties. It is therefore the great problem of government to keep this class of men prosperous and contented. The men who founded those old cities like the men who founded this republic, and who fought for it during our war, recognize this foundation truth of history, yet each and all of them have somehow failed to make the generation which followed them understand it as they did. As an illustration of what I mean, suppose you sit down with my boy, with your boy, or any group of young men, and try to tell them the true story of your competence or of your political convictions. Eight chances to ten the boy will get the form of it, but will not get the spirit. You cannot make him understand fully, because you are talking the hard language of experience which is a language he has never learned. It is as if you were talking to him in a foreign tongue. You will not and cannot reach common ground with him on material things, not until you strike that strange and unknown quality which we call sentiment, or the spiritual side of public life. All through these long years men have been handing the slave which they have conquered, over to their boy, not realizing that they have set a master over the young men without giving the true weapon needed to reduce him to a useful servant. For you and I, and all the rest of us have talked to our children and to others too much from the viewpoint of material success. The bright, clean and hopeful minds which are to take the slave of our generation have not understood just what the legacy means. You see it all comes back every time we start to the same point, the life, the essential thing of all freedom is the moral or spiritual side of it. That is the one universal language of manhood which binds one generation to another, the great conquering force which makes the slave of the father easier for the son to handle.

Granting all this, what can I do; what can you do to help the cause of the common man? There are certain well defined things which we should stand for always, definitely, openly, everywhere. Let me name a few of them. Legislation against child labor. When tender children are driven to work before their time, you and your children are injured in two ways. Whenever children anywhere are denied the right to a fair childhood, your children and mine must face in the future a moral competition which could not help but sadden them. To work little children, or to overwork men and women, means degrading competition for you and me on much the same principle that the slave was the real enemy of free labor. I think farmers, of all men, should support labor laws which prevent what I call degraded hand labor.

Fair Credits for Farmers.

There is now a movement on foot to establish in this country a system of agricultural credits which will enable a farmer to obtain cash in his business as readily as the merchant or business man. You may not in this neighborhood feel the need of such credits as they do elsewhere, yet that is no reason why you should not support the principle. In the European countries such a system has been established, and has practically saved the European farmers from bankruptcy. We have in this country for years been trying to teach our farmers how to grow larger or better crops. This education always means an added expense for tools, methods, fertilizers, and also for transportation. That is one reason why so many farmers have been unable or unwilling to take up this science or improvement. It costs too much in cash, and they have not been able to obtain credit, for it would seem as if agricultural development and money march side by side. Thus we have in a way been putting the cart before the horse in our agricultural development, by offering the farmer an education which makes money expenditure necessary; at the same time we have made it impossible for him to obtain the needed money, after seeing that he could use it to advantage. In Europe and England, as I think wisely, the reverse of this has been worked out. Farmers were given fair credits ,and taught the possibilities of co-operative work before scientific education was put so much before them. That is one trouble, in this country, with scientific education, it has been of most benefit to the rich and the strong who have the needed capital to put the theories in practice. It is a patriotic duty of every farmer to help as he can the extension of this credit system.

Parcels Post.

For years as you know, our people have been held up and robbed by the Express Companies and Railroads for transportation service. While every other civilized nation has reformed its postal service so as to give fair competition, this government has persisted in charging such high rates of postage that our farmers are denied the direct trade with consumers which European farmers enjoy. On January 1st we are to begin in this country a new system of Parcels Post. It is not all we need, or all we deserve, but it is a beginning, and the extension of it to what we need will depend upon the way our farmers use it. It is, I believe, the duty of every farmer to make the greatest possible use of this service.

We can make it grow and develop as we did rural free delivery, if we will patronize it and make it pay from the start. There is more at stake in this thing than you imagine. It means the beginning of a revolution in transportation and business putting both back nearer to the people. I do not see how we can help following the English system of gradually putting railroads, telegraphs, telephones and similar utilities more or less under government control. I think that is the universal tendency of the times. In England the result of this has been to give the small freeholder and the tenant a fairer share. While fifteen or twenty years ago it was openly stated that English agriculture was ruined, to-day the English farmer is, on the whole, better off than ever before. This is true even in the face of the fact that imports of food into England are greater than ever before. It is not due so much to the increased production, or better farming, as to the fact that through fairer transportation and co-operation English farmers get more of the dollar than they did before. I think the same thing is to follow here, and that Parcels Post is the beginning of the use of public utilities for the direct service of the people. We as farmers have it in our power to bring this about, or to make a failure of the system.

Pure Food and Honest Packing.

I think it is the duty of every citizen to support all laws to prevent deception of any sort. Guaranteed food and packing is the foundation of direct trade to the consumer. He has been deceived so often that he will gladly give his money to the man who hands him a square deal and a fair bargain. Pure food and package legislation with Parcels Post are the connecting links to bring producer and consumer together. When you can do that you have the whole thing in your hands. I could name other specific things which all good citizens should support, no matter what party they think they belong to. These are not party questions, but patriotic questions, because they get down to the root of things, the rights of the small freeholder to live and prosper.

The old soldier I mentioned, and others of us could not make the boys understand because we kept on talking party to them, instead of patriotism. For years you and I voted for the shell of an old party name, while our boys wanted the heart and soul of something which we could not give them. Let me tell you what we have been doing by this illustration. Suppose one party made a wise "resolve" that fruit diseases are a menace to prosperity. They resolve that lime and sulphur is the remedy, and they pledge themselves to use it. Along comes a sulphur manufacturer and puts up $25,000 to pay campaign expenses. After election that man feels that he has bought and paid for the right to demand that each member of that party must use lime-sulphur. Of course every good party man will do it and pay the full price, but now comes the other party. It also denounces plant diseases as a menace and pledges its members to use Bordeaux mixture. Up steps a manufacturer of sulphate of copper with another $25,000, which carries the same right to demand that all good party men use Bordeaux and also pay full price. You may smile at this, but in a larger way that is just about what we have been doing, and what we have been teaching our boys as their political duty. We want and we need a different plan. We want to all get together on the proposition that plant or political disease is a menace, but that we do not care what you use so long as you kill it.

Granting this, again the question comes, *how* can we do our duty? I mention three ways,—organization, courage, steadfastness. You are doing the first right here. I see some of your fruit in New York. People group around it and watch the apples and the labels. You have grown slowly and well. Every man who packs an honest box or barrel of apples gets into his heart a little of that pride and joy in his business which means more than dollars in his pocket. For I suppose you realize that through the years few really enduring things are made with the hands. Progress is through heart and character, for as the old hymn puts it, "Not the labor of my hands shall obey my Lord's commands." In learning how to combine over an apple you men are also learning unconsciously how to get together for the larger and nobler things of life. These may be packed in a box of apples as well as in a picture, a sermon or a poem. Do you recognize how the cohesive strength of a great army depends upon that little joint in the human arm which we call the elbow? Soldiers tell me that when they march into battle ninety per cent. of the regiment feel that they would gladly run if they could, and if they were alone. But on either side they can touch another man's elbow. He is just as frightened as they are, but all are depending on the light touch of that elbow to hold them in line.

You men in Adams County are showing us the way by building a home organization. That is the way it must come, dozens and hundreds of smaller packing societies first of all, and then these welded together into a federation. No one likes to be drilled, and least of all a farmer, yet drill is all there is to it when the battle comes.

And the duties of citizenship also involve courage of a rare and patient sort. It requires rare courage for a man of common life to leave his party when he knows it is wrong and give a fair reason for leaving it. No coward could possibly stand for an unpopular cause which he knows is right. There are dozens of things in business, we meet them day by day. They might be profitable right now, yet to do them means taking an unfair advantage of a neighbor or a customer. It requires rare courage to refuse to aid them, or to point them out to others, yet only in this way can the plain people expect to drive dishonesty out of high places, for the morality of high places comes from that in the lower walks of life. It is not the complacent compromiser, but the clean fighter who can move the world onward. Suppose that right here in this town, or in Adams County there could be organized a body of men who would swear to put patriotic feeling absolutely above party. These men would denounce dishonesty at home or at Harrisburg. This would not be done bitterly with meanness or malice, but on the highest ground of patriotic duty. These men would organize and vote absolutely only for clean and capable men, the best citizens they could find. They would stand by this resolution, and by these men through loss, ridicule or abuse. Do you know what would follow; within a few years the great majority of the people of Adams County would be solidly behind these men, and all over Pennsylvania this county would have a political reputation equal to that it now enjoys and will enjoy for apples. You would attract attention from every political boss in the State, and you can generally measure the efforts of a man for really good citizenship by the abuse he receives from the boss. There would be attempted bribery, bulldozing, bluff, and personal abuse. If the men I speak of would live through it all with courage and patience as Moses did, as Lincoln did, as every great leader has done, Adams County would be famous throughout the world, for it would give the world a model for good citizenship and political life without graft, but with business honor. I do not speak of the impossible. I am telling you just exactly what will be done in some community and some county in the future by just such a body of men as you can find here.

And the good citizen must be steadfast. By that I mean patient and enduring. One trouble with us all has been impatience with the slow and the faltering. Those of us who have received the blessing of competence or education or power, are like those men who cannot make the younger generation understand, because we have forgotten the language which may go with poverty, depression, lack of hope or of opportunity. I think our trouble is that we ourselves out of our superiority cannot understand the real lesson of growth or the obligation which we owe to society.

TEST YOUR LIME-SULPHUR SOLUTIONS.

WINTER INJURIES TO FRUIT TREES.

Prof. M. A. Blake, *Horticulturist, New Jersey Agricultural Experiment Station.*

Mr. President, Members of the Adams County Fruit Growers' Association: Ever since I have been located in New Jersey I have heard a great deal about the good qualities of Adams County, and I certainly agree with all the statements I have heard. I have also heard that this is the real home of the York Imperial apple, and you certainly have some very fine ones on the stage this morning.

Sometimes we say things that are not presented in such a manner as to mean just what we intended they should, so I have written a paper which I am to present to you this morning on "Winter Injuries to Fruit Trees."

The winter of 1911-1912 was a most severe one, both from the standpoint of low temperatures, and in the variety and amount of winter injuries to trees and shrubs of all kinds.

The weather during December, 1911 was so mild that the fruit buds of the peach made considerable development throughout the eastern peach districts. These conditions were followed by unusually low temperatures in January and February, combined with dry cold winds.

The foilage of such hardy trees as white pine and hemlock suffered marked injury, and California privet was severely killed back in numerous instances.

Bark splitting and collar injuries were unusually common, especially upon peach trees, although the cherry and the apple received severe injuries in some instances.

The sap wood of peach trees was discolored even in the extreme southern end of New Jersey, yet, very little twig killing occurred even in the northern end of that state.

The warm weather of the early winter followed by extremely low temperatures combined with high, dry and cold winds, account for the severity of the damage done.

A discussion of the various forms of winter injury to fruit trees would seem to be a matter of considerable interest to fruit growers at this time.

The various forms of winter injury to fruit trees can be classified as follows: Root injuries, twig and wood injuries, trunk splitting, bark splitting, collar injury, sun scald and bud killing.

This is rather an imposing list, yet unfortunately, with the possible exception of root killing, I think that all fruit growers of considerable experience can recall an acquaintance with the entire list at one time or another.

Although an extremely low temperature is an important factor in causing winter injuries, yet, extreme variations in temperature, lack of moisture in the soil, high winds, the kind and variety of tree and its condition are all of much consequence.

The weather conditions, during the late summer and fall and just preceding winter should never be overlooked in investigating any case of winter injury.

It is a commonly stated fact that a late, sappy wood growth is responsible for the severity of winter injuries to our fruit trees. This is undoubtedly true in numerous instances, especially in the extreme northern fruit districts, but it is equally true that a severe drought and sudden check in the development of the trees, in the late summer and fall, may result in winter injuries equally severe. This latter fact has been generally overlooked in emphasizing the importance of well ripened wood to withstand the winter.

Evaporation takes place from the branches and twigs of trees and shrubs throughout the winter, and if one will but examine the twigs of fruit trees following a very cold, dry period, the bark of the twigs will appear to have lost some of its brightness and fullness and may even be slightly shriveled. If the cold, dry period is followed by rain and high temperatures the bark on these same twigs will become much brighter and more full. The tree has taken up more moisture and it is indicated in the appearance of the bark.

Serious injuries are certain to occur to fruit trees whenever the soil freezes to the full depth of the root system, followed by a considerable period of dry, cold winds. The twigs and branches of the trees may be actually frozen dry, especially if the soil was dry previous to freezing.

Apple trees in full bearing are sometimes killed outright, in a single winter, in the Dakotas and in some of the provinces of Canada. Root injuries are caused by low temperatures and by alternate freezing and thawing of the roots. Such injuries are quite common in extreme northern fruit districts, and are most severe in those localities when the soil is dry and the ground free from snow, during cold periods.

Experiments conducted by the Nebraska Experiment Station are of much interest in this connection. Fruit trees were planted in boxes, containing different amounts of moisture ranging from 15 to 25 per cent. just before winter. Some also received a straw mulch, others were covered with snow whenever snow fell, and some were stored in a cool dry cave. More than sixty per cent. of the trees died in the boxes where the moisture content was 15 per cent. Less than 15 per cent. of the trees died where the moisture content was 19 per cent. Not a single tree died in the boxes mulched with straw, although the moisture content was only 16 per cent. Some trees died in the boxes that were occasionally covered with snow and whose moisture content was 15 per cent., but the injury was much less than in the uncovered boxes containing the same amount of moisture.

No root injury, whatever, occurred to the trees stored in a cool, dry cave and it was inferred that cold and dryness are the important factors in causing root injuries.

The fact that root injuries are so severe in dry soil is that the cold, dry air comes in contact with the roots and dry freezing results.

Trees whose roots are entirely killed or severely injured are likely to die immediately, and before growth begins. Trees less severely injured may start into growth and then suddenly die with a crop of fruit upon the trees, while still others may continue a lingering existence until insects and diseases and further winter injuries overcome a waning vigor.

How can we prevent or lessen the dangers of root injuries? We know that certain stocks are more hardy than others and in districts where much root killing occurs this is a matter of the first importance. In general, root injuries to fruit trees in central Atlantic Coast districts are not of the most severe kind, and, yet, minor injuries in certain forms may finally result in much damage.

A good cover crop upon the soil will tend to prevent deep freezing; it will also help to retain snow and moisture, and may be an important factor in the prevention of root injuries in winter.

Twig and wood injuries commonly occur in connection with root injuries, but such is not always the case. The twigs and branches of trees are sometimes injured when no root injury occurs and vice versa.

Very low temperatures are likely to result in considerable killing back or twig injury, especially upon the more tender fruits. This is most severe upon strong, rich, moist soils where a late wood growth occurs or where a severe drought suddenly stops wood growth in mid-summer. Varieties of apples, peaches and other fruits which ripen their crop relatively late in the season are often more severely injured than varieties which ripen their fruit early. The late maturing varieties are obliged to keep in a more active growing condition in order to mature their crop, and have a very short time in which to give their entire energy to the maturing of fruit buds to withstand winter conditions. An example of this occurred in New Jersey in the winter of 1910-1911, when the fruit buds of many late varieties of peaches failed to pass a comparatively mild winter successfully. We undoubtedly have two extremes to guard against, a too prolonged wood growth and a too sudden and early check to wood growth. The former may be of much greater importance in northern fruit districts, but the latter is of equal or more importance in southern New Jersey and districts south of that locality.

In severe winters, injury to the sap wood of the larger branches, and the trunk may occur in addition to twig killing. The young sap wood may be killed while the cambrium remains alive and continues growth the following spring. The injured wood becomes spongy, commonly turns brown or black, and a split trunk or a broken branch becomes the open door for various wood destroying fungi to enter.

Trunk splitting is perhaps most common upon peaches, cherries and plums, but unfortunately, our other tree fruits are not altogether free from such trouble. It is believed to be the result of a sudden and severe drop in temperature causing a contraction of the bark and outer layers of wood and that it is most likely to occur to trees that have made a late growth.

Bark splitting is much more common than trunk splitting and occurs under conditions similar to those which cause trunk splitting. A warm, moist, late fall, followed by snow and a sudden and marked drop in temperature are ideal conditions to bring about trunk splitting and bark splitting. The age, variety and actual condition of the bark and wood of the tree will, of course, determine the extent of the injury.

Sun scald is a term applied to a type of bark injury in winter. It is most common and severe upon young trees in northern and western fruit districts. It consists of the killing of the bark upon portions of the trunk, and sometimes of the main branches, where most directly exposed to the sun's rays. This injury, therefore, occurs principally to the south side of trees, and is most likely to occur during the late winter when bright days are followed by cold nights.

Where the trunks of the young trees are short and partially shaded by the branches, such injury seldom occurs. However the trunks of rather high-headed trees can be artificially shaded by laths, pieces of corn stalks, veneer, or even sprayed with whitewash if there is much danger of injury of this nature.

Collar injury is much more common and serious than sun scald or bark splitting with either apples or peaches. During the past few years extensive injury of this nature has occurred to peaches in nearby districts.

The term collar in the vocabulary of the nurseryman and the fruit grower, is a term applied to that portion of the trunk of a tree where the bark of the trunk above ground meets the bark of the root at the soil line.

Upon young trees this is readily detected by the difference in color of the bark. But unless the tree has been grafted or budded at this point, there should be no very marked difference in the bark structure. There generally is, however, a marked difference in the ability of the bark of the trunk and the bark of the root to withstand exposure to weather. The bark of the root being accustomed to the protection of the soil is likely to be severely injured if such protection is removed by the washing away of the soil or by having it removed in an attempted freeze out of borers.

The collar of a fruit tree, in fact, is a very critical point in the whole structure of the tree. It is where the freezing and thawing process is likely to be most severe for within a comparatively short space up and down the trunk the bark above ground may be frozen solid, while just below it may be free from frost and vice versa.

During high winds the twist and strain upon a young tree may be severe at the surface of the soil, especially if the ground is frozen. Fruit trees are commonly planted so that the point of budding is at or near the surface of the soil, and even though the union between the top and the root be a most congenial one, nevertheless, it is the point where the freezing and thawing process is most likely to find a weakness.

It is not so remarkable then that fruit trees suffer considerably from collar injuries, which commonly result in what is termed collar rot.

The actual decaying of the bark is secondary and is preceded by winter injuries, which actually damage the bark. Such injuries are quite common in New York State and our more northern fruit sections, especially with varieties of apples, such as the King and Gravenstein.

Collar injury to apples is not common in New Jersey, but much damage has occurred to peaches. Collar injury or collar rot, if severe, results in the killing of a section of the bark completely around the trunk, near the surface of the soil, while above and below this point the bark of trunk and roots may be free from injury. The tree is now girdled and will continue to live until the stored up food, in the roots and top, is exhausted, when it will suddenly die.

In less severe cases where only a portion of the bark is killed the tree may continue in fruit bearing for several years. But unless given attention, the injury is likely to grow more severe each year. Borers, bark beetles and other enemies add to its troubles and the tree dies.

Collar injuries which effect the bark, but not severe enough to destroy it at first are quite common upon peach trees. The effect of slight damage is usually first observed in a rolling and early ripening of the leaves in the middle or latter part of the following summer, and if not too severe the fruit will be forced up to a larger size than upon normal trees in the same orchard. Such forced fruit is sometimes slightly bitter, but in any case, it can always be detected by its coloring. Minute white dots, even in the highest colored specimens tell the story. Trees injured only to this extent are likely to decline rapidly unless cut back and well cared for.

The killing of fruit buds is a form of winter injury that is better understood, generally, than some of the other forms of injury, already mentioned, but the exact cause of the injury in each case is not as easily determined as is sometimes supposed.

Late fall growth with immaturity of buds, low winter temperatures or a premature starting into growth during mild periods are common causes widely accepted. Let me add to these above-mentioned factors the poor development of fruit buds due to dry and unfavorable soil and weather conditions, in summer and fall.

Minor winter injuries to the twigs and wood of fruit trees sometimes occur, which have the effect of a slight check to the vegetative growth of the tree. This may not be apparent in the color of the foliage, but is shown in the slight forcing effect on the fruit. Sometimes the fruit upon certain twigs of a tree will be forced to a large size, while others will be below normal in size and may even fail to ripen. Even very large and very small fruits may occur on the same twig in cases of minor winter injuries to the wood.

What methods of orchard practice can now be followed to prevent or lessen the various winter injuries to fruit trees?

All forms of winter injury are most severe upon low and poorly drained land.

Peaches especially should be set upon elevated sites in all sections not influenced by large bodies of water. There were practically no peaches in Connecticut or northern New Jersey the past season below 600 feet elevation, while there were good to full crops upon standard varieties at 600 to 900 feet elevation.

The state experiment orchard at High Bridge had the best crop in its existence, while the peach section of Annandale and Lebanon produced but little fruit. The orchard at High Bridge is at an elevation of 650 to 700 feet, while most of the orchards about Lebanon do not exceed an elevation of 400 to 500 feet, and many are not above 200 to 300 feet. The past season clearly demonstrated the importance of proper elevation.

Very dry soils may be listed with poorly drained soils as a thing to be avoided.

Hardy varieties of fruit should be given first consideration.

Vigorous and well-grown stock should be purchased. Any weakness of the tree itself makes it more susceptible to winter injuries.

Thorough cultivation and proper fertilization during the growing season is essential to promote vigor. Trees weakened by neglect are more susceptible to winter injuries.

A good thick cover crop in the orchard retains moisture, prevents deep freezing and may lessen or prevent root injuries.

Much collar injury may be prevented by mounding the soil up about the trunks of the trees just before freezing weather in early winter. This applies especially to peach trees.

Apple trees which have a portion of the bark killed at the collar line should receive prompt treatment. The injured bark should be cut away and the wound coated with a good fungicide such as Bordeaux Mixture. Fungi which cause decay of the bark occur generally in the soil and will quickly attack injured bark, while if the injured part is removed and a fungicide applied the development of the rot and further injury to the tree may be prevented.

If the injury is serious annual treatment of the wound is recommended, and a mound of soil should be made about the trunk every year just before winter.

Neglect of cultivation, especially in a dry season, is likely to add to the severity of winter injuries. The dryer the season the more important it is to keep up cultivation, not only for the benefit of the crop on the tree, but for the crops to follow.

Good care and close attention to details in the management of an orchard are far reaching in effect. Vigorous, healthy and well-cared for trees are able to successfully battle single-handed against many enemies, but weak, neglected trees are so besieged with troubles that both grower and trees become discouraged and give up the fight.

Take good care of your trees and they will respond by taking care of themselves.

Discussion.

Prof. Stewart. I would like to ask Prof. Blake if he has had any experience with June buds.

Prof. Blake. In practically all cases I would prefer a one year old tree to a June budded tree. We have found it difficult to find large, vigorous June budded stock. If you can secure June buds from two to two and one-half feet high they might be satisfactory, but we have often had difficulty in securing them from one foot to eighteen inches high. We have found that the better the soil conditions the better the smaller grades will do.

R. M. Eldon. Would you prefer northern grown trees to Tennessee grown peach trees?

Prof. Blake. I would not make any difference there provided the trees were well grown and free from disease. That is the important point, to have them well grown and free from diseases.

Mr. Bassett. What of storing trees in cellars for winter.

Prof. Blake. If they are properly stored I think the trees are all right.

Mr. Bassett. What do you mean by "properly stored"? How are you going to handle them so that they will be?

Prof. Blake. They should be stored so that they do not dry out. I should say that if the trees are taken up in the late fall and put in the storage house where the roots are kept moist and the temperature held between 35 and 40 degrees, I should say the trees are properly stored. I have planted a good many stored trees in my experiments and we have taken measurements of the growth of the trees, and I cannot see where there is very much difference between stored trees and freshly dug trees. On the other hand, stored trees in many cases should always be soaked in water for sometime before they are planted.

Mr. Bassett. As compared with the practice of heeling in, which is the old common practice, have you had any comparison with trees stored in cellars against trees that were heeled in?

Prof. Blake. Our experience has been with cellar-stored trees against freshly dug trees. If the trees are properly stored, I do not see why they are not just as good as trees left out over winter.

Mr. Newcomer. In a peach orchard three years old that was badly frozen last season but made a good growth this season, is there any possibility that these trees, with treatment, will bear fruit for any length of time?

Prof. Blake. If proper attention is given it from now on it ought to be very successful. I had some experience with an orchard three years ago that went through a severe winter. The orchard revived and bore a very heavy crop after that.

Member. I have an orchard in that condition. Last winter it froze down and looked as though it had been burned over by fire. We have given it as first-class cultivation as we know how and it made a good growth, but the trees in many instances seem decayed at the heart.

Prof. Blake. If the trees are well cared for I think the chances are you can get profitable crops. I certainly would not give it up.

C. J. Tyson. What would you think about the probability of trees overcoming winter injury to the hard wood?

Prof. Blake. If they make a good growth they will overcome that injury, of course, but will be weaker than trees that have not been effected in that way. Some orchards that have been injured in that manner continue to bear good crops. The wood in the centre is not quite so strong.

R. A. Wickersham. Have you in your observation ever seen trees bearing fruit on one side and the other side not bearing, on account of hard winds?

Prof. Blake. That fact occurs in some instances. The bees and insects that pollinate the fruit will not work in the face of a very cold wind. You will find the bees all on one side of the tree, and if it happens to be a variety that needs cross-pollination, the fruit will set largely on that side of the tree. It has been very clearly shown that the pollen of the apple is not carried by the wind to any extent. Sometimes, of course, the weather might be so cold that the wind itself would injure the blossoms on one side of a tree.

A. W. Griest. To go back to injury of peach trees by cold, last spring I planted out a lot of peach trees, and about one-third of them, later in the season, started to grow and send out those shoots from down near the ground. One-third of them did not start at all, but I found later, in pruning the trees, that every tree was injured at the heart. The wood was absolutely dead. What would be the result with those trees if I let them grow? Some of them afterward made a very fine growth, sending up large, healthy shoots.

Prof. Blake. The trees that made a good growth I think will overcome it. As the trees are young I do not think the injury is sufficient to permanently injure them. They ought to come out of it all right.

C. J. Tyson. Would you give the same answer if they were apple trees? We had the same experience with some apple trees last spring.

Prof. Blake. Yes, if they made a good growth I think with good care they will overcome that injury.

Mr. Bassett. There is one important matter right here, at least it is important with us, that I want to bring up, and that is the selection of nursery stock. We do not like the average cellar-stored tree. Now the professor is absolutely right if the tree is perfectly stored, but that is the problem. I do not say that they do not store them right, but the results we have had, of late years, from cellar-stored trees have been bad. We compared right side by side trees that were stored by nurserymen and by our own farmers in Michigan. They were stored in the fall and came to us in spring delivery. Spring delivery trees are cellar stored trees. The results in every instance have been three or four times as good from the heeled-in trees as those stored in cellars. In other words, we had four or five times the loss from trees stored in cellars than from the old-fashioned way of heeling them in. If you come to our section now you will find very few cellar stored trees. The main thing is the vitality of the tree. As I said before, they should be properly stored and not piled up like so much cord-wood.

Another thing the professor spoke of is that stored trees are liable to be dried out, and he suggests soaking the trees. When I presented that subject before the Illinois meeting a man objected very strenuously to the idea of soaking the tree. He objected and stated as the basis of his objection the fact that he had compared trees that he applied water to when planting with non-soaked trees, and the result was that the trees that were watered when planted were very poor, as compared with trees that were not watered, which indicated that water should be kept away when planting. I question whether that is the case, but it is worth thinking about. In our section we do not want the ordinary stored tree. We want our trees gathered in the fall, shipped to us, and then heeled in. I think lots of our troubles came from stored trees.

Question. How do you heel them in?

Mr. Bassett. In heeling them in you understand we dig a deep trench, open every bundle and very thoroughly pack the soil around the roots so as to cover them. The wind blows the snow over them and in that way they are protected. They come out of the winter in the very best condition and the result is we get the finest, green, elegantly shaped trees.

Prof. Blake. Certainly, if you take up fresh trees in the fall and heel them in yourself and take care of them, they will be in good, fresh condition, and nearly all of the stored trees are more dried out than fresh stock, and I find that wetting the roots is an important factor in the way they will start out into growth. Where they are stored, or dried out in transit, if you want to get the best results I certainly would put them in water before they are planted. If a plant has a large quantity of water in it it can stand a good deal of drying out without injury.

R. M. Eldon. What objection is there to watering the trees as you plant it?

Prof. Blake. If the soil is properly prepared I do not think it is necessary. It seems to me if the ground is plowed as early in the spring as possible and then the trees put in, they certainly should be in fine condition.

Question. Does not pouring of water on the tree do away with air spaces?

Prof. Blake. I do not see why there should be any injury from pouring water on the trees. The wet ground should be covered up with dry soil. The soil should be in fine condition early in the spring.

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THE USE OF FERTILIZATION IN APPLE ORCHARDS.

Dr. J. P. Stewart, *Experimental Pomologist, State College, Penna.*

The proper fertilization of an orchard is largely a local problem. It is no less a problem, however, because it is local. The same is true, to a marked extent, of many other orchard operations, not excepting cultural methods. It is true that of late it has become a fashion among horticulturists to assume that the whole truth is known about cultural methods, that there is but one proper method for orchards and that all growers who do not follow it are either shiftless or ignorant. But the fact is, that even with cultural methods, the practice found best for one particular soil or location, or for one age of orchard or fruit effect, is by no means certain to be best for all others or even the best for the adjacent farm. In general, therefore, it appears that there are at the present time, comparatively few horticultural principles or practices which are really exact and general in their application. Most of them seem to be quite subject to important exceptions, and hence usually they require some local modification or adjustment, if the best results are to be secured.

So it is with orchard fertilization. We know that it is likely to be important and we can now give approximate general directions for it. But when we come to the actual fertilization of a particular orchard, some local tests and local adjustments are usually desirable.

The Amounts of Plant Food Actually Taken up by a Mature Orchard.

That there is an important need for fertility in any orchard that is actively producing and growing, there can be no reasonable doubt. The actual extent of this need can be approximated chemically by determining the average composition of apple wood, leaves, and fruit, and applying these figures to what may be considered good annual amounts of these three products. This we have done both for apples and for a 25-bushel crop of wheat, with the results shown in Table I. The annual weights for apples are based on a yearly production of 100 pounds each of wood and leaves and 14 bushels of apples per mature tree. All these amounts are distinctly less than those actually observed and reported, but inasmuch as they give an annual yield of 490 bushels per acre of 35 trees, they are considered sufficient for the present purpose.

Table I.—Relative Plant-Food Draft of Wheat and Apples.

(In lbs. per acre annually, based on American and German Averages.)

	Wheat Grain	Wheat Total	Wood Lb.	Lvs. Lb.	Fruit Lb.	Apple Total
Annual weights, ...	1,500	4,200	3,500	3,500	24,500	31,500
Nitrogen (N), ...	30.0	43.7	11.3	25.6	16.2	53.1
Phos. acid (P_2O_5), .	10.0	15.8	3.6	5.3	6.4	15.3
Potash (K_2O), ...	9.8	26.8	6.6	15.9	41.5	64.0
Lime (CaO), ...	0.84	8.0	29.1	29.5	3.0	61.6
Magnesia (MgO), ..	3.0	6.1	4.4	8.9	3.4	16.7
Iron (FeO), ...	....	....	0.5	1.5	0.8	2.8

In the first place it will be noted, that in total food draft, the apples exceed the 25-bushel wheat crop in every constituent except phosphoric acid, and in it they fall behind only by half of a pound. Notwithstanding this fact the trees are usually able to maintain themselves much better and longer than wheat. This is probably largely because of their much longer season of root-activity, their more natural demands,* the annual return of most of the plant food in their leaves, and their ability to curtail production for one or more seasons when conditions become unfavorable. Without going into details, however, it is quite evident that very important amounts of plant food are annually removed by an apple orchard. Scarcely any soil can furnish all these materials indefinitely in the amounts and times required, and unless proper assistance is rendered, there must come a time when production is materially reduced and off-seasons occur.

It is also interesting to note the relatively large amounts of nitrogen, potash, and lime, and the comparatively small amount of iron annually taken up by the apples. Nearly all the lime remains in the wood and leaves, while a large proportion of the potash is found in the fruit.

This large amount of lime seems to have some significance, so far as the wood is concerned, because, as shown later, in most of our experiments, its application has improved the growth. In view of the small amount of lime required by the fruit, however, its application should not be expected to materially affect the yields, and this corresponds with our field results. Moreover the total effect of adding lime alone surprisingly small, in comparison with the relatively large amounts that are taken up. Either these amounts are merely drawn in and deposited mechanically by the transpiration stream, and hence are largely without physiological significance, or else the average soil is still able to supply the lime needed.

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*This is especially marked in the case of the fruit as compared with the demands of the grain in wheat. For further discussion, see article by the writer in the Annual Report of the Pennsylvania State College for 1910-11, pages 447 to 449.

With iron the case is very similar. This element is almost universally present in agricultural soils and the total amount required is so small that its addition can scarcely be expected to produce any important effect. This also is borne out by such experimental results as are now available.

From the large amount of potash carried by the fruit, one might suppose that its addition to the soil would be very important in improving yields, and this idea has been widely proclaimed, especially by those considering only the chemical composition of the fruit. As indicated later, however, it seems that most orchard soils are already sufficiently supplied with potash in available forms and that the chief shortages occur in the nitrogen and phoshates. This is the case notwithstanding the fact that the latter materials are actually required in considerably smaller amounts.

From these facts it is evident that there is comparatively little relation between response and requirements in the case of plant food and that something more than a knowledge of the chemical composition of the fruit and wood is needed before one can properly fertilize an orchard. Even with the additional knowledge of the composition of the soil, the problem is not much simplified because it is impossible as yet to duplicate sufficiently the conditions existing in any soil.

A chemist may determine the total amount of plant food present, but he can not yet determine their actual availability to the trees with sufficient accuracy to be of much value. The practical and proper fertilization of an orchard, therefore, becomes an experimental problem, and its solution is dependent primarily upon the pomologist or horticulturist. In other words, the question is not so much what amounts of plant food are annually taken up, nor what amounts are present, but rather it is what responses are made when certain kinds and quantities of plant food are actually added to an orchard soil.

It is to get light on the latter question in connection with ten different types of soil that we have been working at the Pennsylvania Station since 1907. Altogether in the case of apples we have ten experiments on bearing trees, and two on young trees involving a total of more than 2,800 trees, located in different parts of the State, all of which bear more or less directly upon the present question. For the present, however, we shall call special attention to but three of these experiments, since they bring out most clearly the principal points involved.

Effects of Plant-Food Additions to Orchards.

Some of the effects of adding plant-food to orchards are shown in Table II. This table gives the yields obtained during the past five years in a 10-plot experiment with Baldwins, now 24 years of age, located on a Volusia silt loam in Lawrence County, north of Pittsburgh. In estimating the influence of the treatments, the yields of the first year are excluded because they can never be materially affected by the applications of the first season. The yields are given in pounds, and also in bushels per acre annually for the last four years.

Table II.—Influence of Fertilization on Yield.

(Johnston Orchard.)

(*Yields in pounds and bushels per acre;* 1908-1912.)

Plot	1 Check	2 Nit. & Phos.	3 Nit. & Potash	4 Check	5 Phos. & Potash	6 Comp. Ftlzr.	7 Check	8 Manure	9 Lime	10 Check
	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.	Lb.
1908, ...	90	528	237	446	57½	759	211	278	558	106
1909, ...	675	6,018	5,257	1,932	3,089	6,621	2,008	3,531	1,216	1,266
1910, ...	2,575	3,265	1,822	3,168	3,552	2,108	1,629	6,149	3,185	3,505
1911, ...	283	7,563	7,816	617	1,227	8,209	1,362	4,874	388	106
1912, ...	1,024	1,225	696	1,382	1,385	189	1,226	6,698	741	474
Total 4 yrs., .	4,557	18,071	15,591	7,099	9,253	17,127	6,225	21,252	5,530	5,351
Bu. per A. Annually, ...	136.7	542.1	467.7	213.	277.6	513.8	186.7	637.5	165.9	160.5
An. Gain over Chk.* Bu. per Acre, ...	......	377.9	293.5	......	103.4	339.6	......	463.3	8.3	......

*The average check or unfertilized plot produced 174.2 bushels per acre annually during 1909-12.

In the first place, it will be noted that the checks, or unfertilized plots, have run fairly uniform, producing an average annual yield of 174.2 bushels per acre during the last four years. Lime alone (at the rate of 1,000 pounds per acre annually) has shown no improvement over the average check, and as a matter of fact it has averaged 8.3 bushels per acre less, a deficit that is doubtless largely or wholly due to incidental and natural fluctuations. The phosphate and potash combination has affected the yield here rather distinctly. This may be at least partly due to a possible advantage in location, as indicated by the fact that its adjacent check is the highest producer among them and is averaging within 64 bushels of the phosphate-potash treatment. The growth on the latter plot, however, is nearly 3 per cent. less than the normal unfertilized plot, and its general appearance is not appreciably superior to that of the checks. It is evident, however, that these trees are still vitally in need of something, although it should be noted that they are receiving the fertilization commonly advised for orchards,—largely on the basis of chemical analysis

This need is being quite thoroughly met on the adjacent plot 6, which differs from number 5 only in the addition of nitrogen. The mere addition of nitrogen in this case has more than tripled the gain. Wherever nitrogen appears in the treatments very large yields are observed, and the foliage and growth of the trees are very satisfactory,—the average gains in trunk-girth ranging from 25 to 90 per cent.

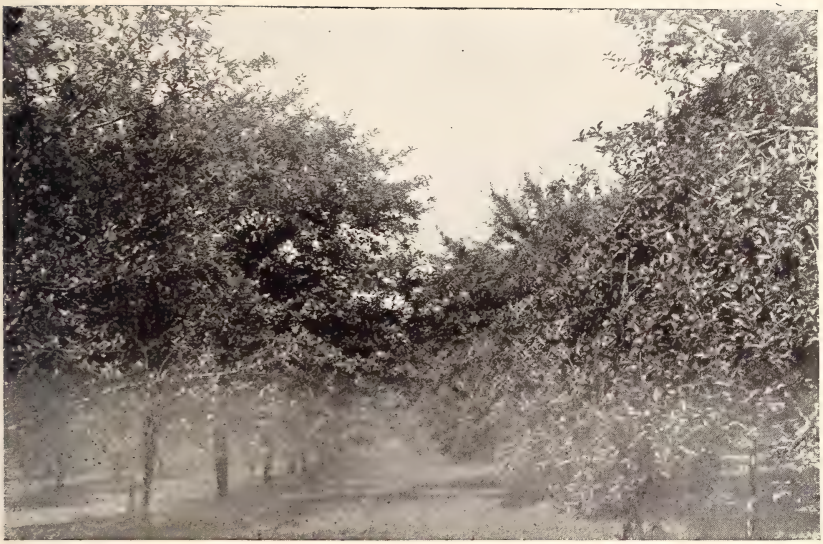

Fig. 5. COMMERCIAL FERTILIZERS VS. NOTHING.

The row on the left has received no fertilizer. That on the right has received nitrogen and phosphate. The net *increase* on the latter was $267.00 per acre. Variety Baldwin. Treatment identical except as to fertilizer.

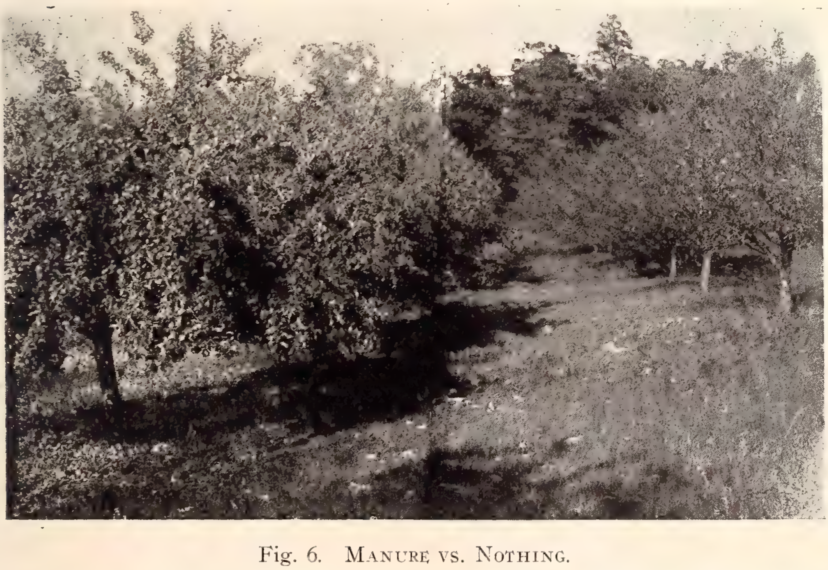

Fig. 6. MANURE VS. NOTHING.

Row on left received stable manure third year. Produced 373.8 bushels per acre. Row on right received nothing and produced 27.9 bushels per acre. Treatment otherwise identical. Variety York Imperial.

Plot 2, receiving nitrogen and phosphate only, at the present time shows a better gain than number 6, which receives potash in addition. This is directly connected with the almost complete crop-failure that occurred on the latter plot this past season, and it is also doubtless partly attributable again to natural fluctuations in yield. It shows, however, that no additional potash is needed in this orchard, so far as yields are concerned.

Phosphates are next in importance to nitrogen here, as indicated by the 42-bushel average deficit that occurs in plot 3 as compared with number 6, when phosphorus is omitted in the former, and also by the high yields on number 2. Manure, as a result of the extra large crop of 1912, when most of the other plots were having an off-season, is now in the lead in this experiment, with the tremendous average yield of 637 bushels per acre annually for the past four years. This gives an annual gain over the check of 463 bushels per acre, which is a very satisfactory exchange for 13 tons of manure. This benefit from manure is doubtless largely due to its nitrogen content, the proof of which becomes more evident later.

Time Required for Results to Appear.—It is a common impression that long times are required to determine the value and kind of fertilizer needed for an orchard. It will be noted here and in the following experiment, however, that both these facts were thoroughly evident in the season immediately following the one in which the fertilizers were first applied. In other words, both the value of fertilization and the kind of fertilizer needed were clearly evident in these two cases within a single year after the first application, and the conclusions formulated then have not been materially changed by the results of the 4 to 5 additional years that we now have. In most other cases, also, where these facts did not appear in the first two or three seasons of bearing they have not appeared in the five or six years now available. This is of special importance in connection with the local tests recommended later, though in them we advise at least 3 years of trial, for the sake of a wider margin of safety and greater stability in the resulting conclusions.

Results from the Brown Orchard.

This experiment is located in Bedford County on DeKalb stony loam,—a residual, foot-hill soil, chiefly of sandstone origin, which is commonly used for orchard purposes. The trees in this case are York Imperial, now 24 years old. It involves the same treatments as those in the Johnston orchard and four others besides,—those in plots 6, 9, 11, and 12. It also was started a year earlier, in 1907, and the results of that season are excluded in the present table for reasons stated above. The results for the past five operative years are given in Table III.

Table III.—Influence of Fertilization on Yield.

(Brown Orchard.)
(*Yields in pounds per plot,* 1908-1912.)

Plot	Treatment	1908	1909	1910	1911	1912	Totals	Benefit over Normal per ct.	An. Gain over av. Check* bu. per a.
1	Check, ...	2,402	25	4,052	1,588	453	8,520	......	......
2	Nitr. & Phos., ...	4,153	588	5,920	2,219	7,281	20,161	204.8	376.5
3	Nitr. & Potash	3,079	78	3,838	1,567	5,402	13,964	196.6	259.2
4	Check, ...	754	9	470	1,260	309	2,802	......	......
5	Phos. & Mur., ...	1,014	252	2,381	1,643	616	5,906	79.9	75.2
6	Phos. & Sulf., ...	292	266	1,368	1,299	356	3,581	4.8	10.1
7	Check, ...	254	192	1,115	1,568	1,117	4,246	......	......
8	N. Ph. & Pota., ...	1,219	454	2,436	3,241	4,931	12,281	208.7	253.7
9	Nitrogen, ...	863	1,575	120	3,082	1,614	7,254	96.	113.
10	Check, ...	458	515	787	1,448	222	3,430	......	......
11	Acid Phos., ...	104	892	787	794	64	2,641	25.9	16.2
12	Raw Phos., ...	100	124	581	703	123	1,631	55.9	35.5
13	Check, ...	266	257	2,096	498	727	3,844	......	......
14	Manure, ...	621	1,947	778	7,334	1,117	11,797	273.9	240.2
15	Lime, ...	152	160	1,029	1,060	288	2,689	9.0	14.8
16	Check, ...	246	36	943	387	166	1,778	......	......

*The annual gains over their "normal production" are indicated in plots 2 and 3. Their annual yields were 564.5 and 391 bushels per acre respectively. The average check, omitting No. 1, was 3,220 lb. per plot, or 90.16 bu. per acre annually.

In general we have the same types of results here as in the preceding experiment,—large gains from nitrogen, phosphates and manure with relatively small effects from potash, and again no advantage at all from line. There are greater irregularities in this experiment, owing somewhat to its greater size, but chiefly due to the presence of a woods on the mountain side above the first check plot, from which the latter is separated by a single row of trees. The leachings from the floor of that woods have acted much like a nitrogenous fertilizer, and as a result the trees nearest the woods, although of the same age as those farther down, are considerably larger, thus accounting for the greater yields of the first 2 or 3 plots. This influence practically disappears, however, before the fourth plot is reached, as shown by its low yields,—those of a typical check.

The differences observed in the last two columns are due partly to these irregularities, partly to a certain amount of leaching and cross-feeding on the part of some of the checks in spite of separation rows below each treated plot, and partly to a different method of calculation. In one column the benefit is figured on the basis of the normal production of the immediate plot concerned, which method is supposed to eliminate soil irregularities to the greatest possible extent. When the adjacent checks are being benefited by leachings or cross-feeding, however, this method fails to show the full benefit due to the treatment. This failure is especially evident in plot 6, which shows an apparent negative influence in the "normal" column and a positive influence of ten bushels per acre annually in the column based on the average check. The apparent negative influence is due directly to extra yields in the adjacent check plot 7 which is apparently receiving some benefit from plot 8 as a result of cross-feeding. The same thing appears in the negative figures shown by plots 11 and 12, though they are not entirely eliminated by using the average check as the basis. The average check, however, is not entirely free from the cross-feeding influences, since it only distributes the extra yields and hence it is probable that the negative figures in plots 11, 12, and 15 of the last column merely indicate that these materials have no definite influence when applied by themselves, and the further deficits are attributable simply to natural fluctuations.

Returning now to the results themselves, and especially to those treatments not included in the preceding experiments, we may note first that the muriate of potash in plot 5 has given much better gains than the sulphate in the adjacent plot. This is contrary to the results of the Massachusetts Experiment, but similar results are now being shown in all of our own experiments wherever this comparison occurs. Hence the differences in the Massachusetts experiment would seem to be due to something other than the difference in potash carriers. At present, therefore, we believe that the muriate is at least as efficient as the sulphate and in view of the facts that it is cheaper, more soluble, and much less subject to "caking" in the mixtures, we are now using and recommending it for apples.

In plots 11 and 12, and other similarly treated plots in our experiments, we see the apparent futility of attempting to materially improve yields by applying phosphates alone. This is not due to the fact that phosphates are not needed, nor can it be largely attributable to the absence of cultivation, as may be seen by comparing the results in plots 9 and 2. Nitrogen, by itself in No. 9, shows an annual gain of 96 per cent. or 113 bushels per acre, but when phosphorus is added in plot 2, these benefits are more than doubled. Phosphorus as usual, therefore, appears to be next in importance after nitrogen in improving yields.

The Permanence of Fertilizer Influence.—It is another fairly common impression that the influence of fertilizers is transient and that, even where their effect is favorable at first, this effect soon wears out and may leave the soil worse than before. This evidently depends very largely on the character of the fertilization and in this respect apples are not different from other crops. If the gains are induced by some caustic action of such materials as gypsum or lime when used alone, this may actually be the final result.

On the other hand, it should be noted here that in plots 2, 3 and 8, where definite plant foods are being supplied, the effects of fertilization were greater than ever before in 1912, the sixth year of the experiment. The steadiness and regularity of the increases, also, are especially notable in plot 8, which shows a distinct gain in every year except 1909, and in that year the yield would have been fully 1,000 pounds greater had there been sufficient moisture available, to properly mature the fruits that were actually present.

In plots 2 and 3, the fertilization has not been complete and also the yields have been so large in the even-numbered years that it was impossible to prevent some alternation with lighter crops in the odd years. This same general condition is evident to a considerable extent in the Johnston orchard. In other experiments, however, and especially in one primarily on cultural methods in the Fassett orchard, with proper fertilization and with crops ranging between 300 and 600 bushels per acre, we have had steady increases on Baldwins and Spies similar to those in plot 8, which extended over a period of five years before any decrease appeared.

The unusual size of the 1912 crops on plots 2 and 3 in the Brown experiment should also be noted. While their adjacent checks, 1 and 4, were showing an average yield of 73.2 bushels per acre, plots 2 and 3 were producing the tremendous average of 1,217.5 bushels per acre, and 1,006 bushels of this were picked fruit. The terminal twig-growth of the checks, also, would scarcely average half an inch for the season, while that of the fertilized plots, in spite of their enormous crops, averaged from 6 to 8 inches with frequent terminals running up to 2 feet. And all these differences were brought about solely as a result of differences in fertilization. The spraying, pruning, soil management, variety and age of trees, and all other visible features were just the same on the checks as on the fertilized plots.

Results in the Tyson Orchard.

In the two preceding experiments, we have seen very large annual gains resulting from certain fertilization, particularly that rich in nitrogen and phosphorus, regardless of whether these elements were carried in manure or in commercial forms. In these cases also, the gains from potash were relatively small or entirely absent. Thus far in the Tyson experiment, so far as yields are concerned, we have practically the reverse conditions.

The trees in the latter experiment are much younger, being now but 14 years of age. The varieties are York Imperial and Stayman Winesap, the latter having been top worked on certain York rows about 6 years after planting. The soil is a relatively heavy, silt loam, and tillage and annual cover crops have been maintained near the trees practically uniformly since the orchard was started. The annual growth and general appearance of all the trees in this experiment are much better than those of the average check trees in the two preceding experiments. Practically no fruit had been borne by these trees, when our experiment was started in 1907, and there has been but one fairly full crop since then,—that of 1911. The treatments are the same as in the Brown Experiment and the results are shown in Table IV.

Table IV.—Influence of Fertilization on Yield and Growth in Experiment 215.

(Tyson Orchard.)

(*Yields in pounds per plot,* 1908-1912.)

Plot.	Treatment.	1908.	1909.	1910.	1911.	1912.	Totals.	Benefit over Normal—per cent.	An. Gain over Av. Check —3 yr.—Bu. per A.	Growth, Gain over Normal, 6 yr.—per cent.
1	Check, ...	14	95	346	2,053	549	3,057	....	....	....
2	Nitr. and Phos., ...	26	73	301	2,277	464	3,141	8.0	12.2	7.4
3	Nitr. and Potash, ..	43	115	418	3,043	542	4,161	50.9	43.0	17.7
4	Check, ...	21	54	260	1,555	719	2,609	....	....	....
5	Phos. and Mur., ...	26	146	476	2,828	495	3,971	46.1	36.5	8.1
6	Phos. and Sulf., ...	61	179	483	2,352	975	4,050	43.2	36.8	2.3
7	Check, ...	18	45	235	1,777	862	2,937	....	....	....
8	Comp. Fertilizer, ...	21	74	300	2,885	190	3,470	26.7	22.9	12.7
9	Nitrogen, ...	17	83	229	1,746	551	2,626	3.5	4.7	7.9
10	Check, ...	17	89	150	1,579	504	2,339	....	....	....
11	Acid Phos., ...	3	43	153	1,359	655	2,213	9.8	15.8	4.4
12	Raw Phos., ...	4	62	164	2,010	842	3,082	20.0	11.4	0.8
13	Check, ...	31	46	103	1,886	615	2,681	....	....	....
14	Manure, ...	15	52	190	2,333	262	2,852	4.1	4.	14.6
15	Lime (and Ftlzr.), .	27	86	186	1,765	1,113	3,177	13.4	13.1	1.6
16	Check, ...	10	76	115	1,922	739	2,866	....	....	....

As already indicated, the relative youth of these trees make both their yields and differences much less than those in the preceding experiments. With increasing age, it is probable that some of the results may be different, especially in view of the relative growth that is now being made under the different treatments. At present, however, certain facts are of interest.

In the first place, the practical failure here of both manure and nitrogen is quite remarkable. The regular annual application of 12 tons of stable manure, in this case, has resulted in an annual gain of less than 4 bushels of apples per acre. During the same time, nitrogen alone has shown no gain at all, and nitrogen and phosphates, which were so effective in the preceding experiments, here show an annual gain of only 12 bushels per acre,—not enough to pay for the treatment.

Potash on the other hand, in direct contrast to its effect in the experiments above, here shows a distinct gain in yield wherever it is applied. The best of these gains,—in combination with nitrogen, is only 43 bushels per acre annually, but this is more than a 50 per cent. increase over the normal yield, and it shows a fair profit over the cost of treatment, besides giving over 17 per cent. of an increase in growth. Potash applications therefore, have evidently been of value in this orchard, even when those of manure and nitrogen and phosphates were largely failing.

The Action of Manure vs. that of Commercial Fertilizers.—The above facts, taken in connection with those shown in the two earlier experiments, indicate that the plant-food action of manure is practically identical with that of a commercial fertilizer rich in nitrogen and phosphates. It also apparently indicates that the potash in the manure may be less readily available than that carried in commercial forms. The old controversy over the relative value of manure and commercial fertilizers, therefore, is without any particular significance so far as plant food is concerned. Either type of fertilizer may be successful or either may be a failure depending upon the particular conditions involved.

The manure, however, often has some additional value, due to its mulching effect. This, of course, can not be duplicated by commercial fertilizers alone though it may be duplicated by any other kind of a mulch, as has been shown especially in our experiment 339 in Bradford County. The matter of availability also must be often considered and it is for this reason that the relation between manure and nitrogenous fertilizers should be well understood. Besides this, it sometimes happens that large and regular applications of manure result in a distinct increase in the amount of blight, and also in an undue increase in the size of the fruit and in the amount of punky pitting in the latter. In such cases, a reduction in the applications or the partial or complete substitution of a proper commercial fertilizer is desirable.

A Summary of Fertilizer Influences on Apples.

It is impossible in the present space to consider all our experiments singly, to the extent done with the three just considered. Before passing to the last stage of our discussion, however, it seems desirable to present a very brief summary of the fertilizer influences shown in six of our experiments, including the three just considered. This summary shows the calculated influences of the various fertilizer elements on the four important characteristics of apples, viz: their yield, color, average size and the amount of wood-growth. The relative values of the different elements during a five-year period, in terms of per cents. of benefit over the normal results obtained without fertilization, are shown in Table V.

Table V.—Influence of Fertilizer Elements on Apples.

(*Average Benefits over Normals,* 1908-1912.)

(a) Expts. 215, 216, and 220	Yield per cent.	Color per cent.	Size per cent.	Growth per cent. 1907-12
Nitrates in Combin., ...	62.7	11.0	0.7	10.43
Nitrates alone, ...	32.5	12.7	4.3	15.51
Phos. in Combin., ...	20.2	2.1	0.3	2.28

Phos. alone,	10.7	2.7	0.6	2.45
Potash in Combin.,	15.1	2.7	5.8	3.67
Complete Fertilizer,	78.3	15.4	5.2	17.67
Manure,	75.9	11.4	5.8	29.07
Lime Alone,	8.24	0.3	2.0	6.31
(b) Expts. 336, 338 and 339	1908-'12	1909-'12	1909-'12	1908-'12
Nitrates in Combin.,	74.5	12.7	0.4	27.00
Phosphates in Combin.,	33.5	2.8	4.9	0.23
Potash in Combin.,	3.6	1.4	7.1	2.79
Complete Fertilizer,	80.5	15.6	5.2	29.63
Manure,	168.8	15.9	25.2	37.34
Lime Alone,	29.8	5.4	15.9	15.48

Without going into details it may be noted that in general the same influences that have materially increased the yields have also increased the growth. In other words, our best growing plots have as a rule been our best fruiting plots. On sound, healthy trees, this will generally be the case unless either occurs to an abnormal extent, in which case the other may be somewhat reduced. Mild injuries may also stimulate yields at the expense of growth.

In Table V, the most marked exception to our rule above appears in the case of the phosphates, especially in the lower section of the table. This may be connected with the fact that the old wood especially is very low in phosphoric acid, as shown in Table I, and our present definite growth determinations are based upon increase in trunk-girths alone. On twig-growth, however, our observations indicate that phosphate additions have been very helpful, particularly in the Brown orchard. This also tends to bring it in line with our rule above.

The Control of Average Size.—So far as fertilization is concerned, manure and potash are the only materials that have consistently benefited size. The manure influence is doubtless very largely due to its mulching or moisture conserving effect, since moisture makes up about 84.6% of this fruit, on the average.* The potash influence also, so far as it is a definite benefit, is probably brought about through the same medium, inasmuch as potash is credited with some ability to increase the cosmotic power of the cells, thus enabling them to compete more successfully for whatever water is present.

There is also a distinct possibility that the apparent benefit of potash on any size may be largely due to the fact that it is associated with much lower yields than the other materials, especially nitrogen. Conversely their failures to increase size may likewise be due to their association with markedly increased yields.

This brings out the general proposition to which we have called definite attention elsewhere,† that with a normal moisture supply the dominant influence controlling size in apples is the number of fruits on the tree, after this number has passed a certain optimum or "critical point." This point, however, is relatively high, our data showing that even on trees up to 15 years of age, little or no correlation appeared until the number of fruits had reached 1,400 or more per tree. Above this point, proper thinning is the most important means of increasing the size of the fruit. Below it, the size can usually be markedly affected by moisture supply, cultural methods, manure and possibly by fertilizers,—especially those rich in potash. The latter factors may also co-operate in such a way as to materially raise the critical point. In general, however, proper thinning and moisture conservation are the most important means of improving fruit size.

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*See Table XVIII in the writer's article in the Annual Report of the Pennsylvania State College for 1910-11, page 435.

†See article referred to in foot note 2, pages 500-503.

The Control of Fruit Color.—In Table V, it will be observed that none of the fertilizer treatments has resulted in any marked improvement in color. Slight and irregular benefits are shown by potash and some of the phosphate applications, but nothing of any importance. The same is true of iron applications so far as experimental evidence is concerned.

These facts again lead up to the general propositions that color in apples can not be materially increased by fertilizer applications, and that the red colors of apples are essentially dependent upon maturity and sunlight. Conditions that tend to increase one or both of the latter factors, such as late picking, open pruning, light soils, and sod culture tend to increase the red color. Opposite conditions decrease it.

These propositions make it clear why the nitrates and manure apparently injure color. It is simply done by retarding maturity and diminishing the available sunlight as a result of the increased density of foliage. To determine the truth of this, in 1911 we left the fruit on the nitrate plots in the Johnston orchard, until it had reached approximately the same degree of maturity as that attained by the checks when their fruit had to be picked on account of dropping. The delay required was fully three weeks,—from September 29th to October 19th,— and even then the latter fruit picked much harder than that on the checks, besides showing a much lower percentage of drops. The amount of color on the nitrate plots at the latter date also was actually greater by 10% than that shown on the checks at their picking time.

The occasional marked increase on color as a result of spraying is largely explainable on similar grounds. The sprays reduce the worminess and thus enable the fruit to remain longer on the tree. It also may reduce somewhat the amount of foliage as a result of spray-injury thus permitting more light to reach the fruit. In general, however, in improving color, chief reliance must be placed on those methods that tend definitely to secure fuller maturity on the tree and to get the maximum amounts of light to the fruit.

Applying Present Data to Individual Orchards.

In the three experiments discussed separately above, it was noted that the materials found most valuable in the first two were practical failures in the third, and vice versa. In still others we might show cases where no form of fertilization has yet shown a profit. These and other cases prove conclusively the local nature of the problem. Hence not even the experiments of others can offer more than general advice on fertilization of a particular orchard.

This advice can doubtless be made more exact after a personal examination of the orchard concerned, by one who is familiar with orchard fertilization work, or it may be done with a greater certainty if the owner will give attention to some of the more important characteristics of orchards needing fertilization. These are best observed in late summer and fall.

In general the characteristics of the orchard that is certainly in need of a fertilizer are those of starvation. They are usually sufficiently familiar to need no extended description. They are found most commonly in the older orchards that have once borne well but no longer are doing so, tho still fairly free from important diseases or improper drainage. The foliage is sparse and pale in such orchards, and the annual growth stops early and averages short,—often no more than half an inch,—and from this it may range up to two or three inches. In such cases, one can usually apply fertilizers fairly liberally with practical confidence of profits, providing the varieties and other handling are right. Even in such an orchard, however, it is advisable to leave a small typical portion unfertilized to really determine the value of the treatment.

Under opposite conditions, such as obtain in most young orchards, or in any orchard that is still growing and fruiting well, and retaining its foliage until late in the season, fertilization is much less likely to show a profit. Even in such cases, however, there is often enough probability of benefit, to warrant some trial of fertilization, but only over a relatively small area, and with most of the orchard left unfertilized as a check.

These trials are especially necessary in the intermediate orchards,—those on the zone lying between the two extreme types just described. Occasionally this intermediate type of orchard will respond very strongly to fertilization, without necessarily showing the characteristic marks, as is essentially illustrated in the Johnston orchard.

A General Fertilizer Recommendation for Apples.

For preliminary use in such cases, and for permanent use on the part of those who are unable to carry out such a local test as is shown later, we are now recommending the general fertilizer indicated in Table VI. The fertilizers are stated in amounts per acre rather than in amounts per tree, because of the varying numbers of trees that are planted on an acre. The amounts per tree for any particular case are readily obtainable, however, by dividing the present amounts by the given number of trees per acre. With young trees the amounts may be reduced approximately in proportion to the area covered, making this area correspond with that of the roots so far as possible.

Table VI. A General Fertilizer for Apple Orchards.

(*Amounts per Acre for Bearing Trees.*)

Nitrogen 30 lb. (N)	Phosphoric acid 50 lb. (P_2O_5)	Potash 25 to 50 lb. (K_2O)
Carried in:	Carried in:	Carried in:
100 lb. Nitrate and 150 lb. D. Blood.	350 lb. Acid Phos.	50 to 100 lbs. Muriate.
or in	or in	or in
150 lb. Ammon. Sulfate.	200 lb. bone meal.	100 to 200 lb. low-grade Sulfate.
	or in.	
	300 lb. Basic Slag.	

For Young Orchards, reduce these amounts in proportion to area covered.

This table means that a fertilizer carrying about 30 pounds of actual nitrogen, 50 pounds of actual phosphoric acid and 25 to 50 pounds of actual potash should be applied on an acre of bearing trees. Where potash is not known to be lacking the smaller amount may be used, or after a little testing it may even be omitted entirely. With the smaller amount of potash, the essentials of the present combination are carried in 500 pounds of a 6-10-5 fertilizer, and with the larger amount they are carried in the same weight of a 6-10-10 fertilizer or its equivalent. In the usual ready-mixed fertilizers, the nitrogen is likely to be carried in ammonium sulfate, with which some liming may be necessary if many applications are made, and especially if leguminous cover crops or permanent covers are desired. In special or in homemade mixtures, the various elements may be carried in any of the materials indicated in the table.

In our work the nitrogen is carried in the combination of nitrate of soda and dried blood indicated in the table. This combination carries about equal amounts of nitrogen in each material, and it thus gives a quick action as well as one that is prolonged well through the season. The nitrogen, being the costliest and most active ingredient, requires close watching and possible variations in amount, in order to get the most out of it. It may also be secured, wholly or in part, by the use of stable manure or leguminous cover crops where they are available. With the other carriers indicated in the table, we have very little evidence on their relative values as yet and hence those that are actually least expensive or most convenient should be chosen. All applications should be made annually, subject to the variations indicated below.

Time and Method of Application.

The time of application we believe to be of distinct importance, especially in the case of nitrates. While our evidence on this is by no means complete, yet there are good indications that nitrates can easily be applied too early in the season and thus be wholly lost to the trees. Other evidence leads to the opinion that distinct harm may result from their application about fruit-setting time,—especially in the case of the peach. We feel, therefore, that the nitrates should be applied not earlier than petal-fall in apples and probably not later than the middle of July. In general, about the middle of this period should be very good, though some of our best results have come from applications made as late as the 8th of July.

With the peach in Missouri, Dr. Whitten reports that the time of application is very important and that very large increases in yield have been obtained from moderate quantities of nitrate of soda alone when "applied at the right time."* This is considered to be "after the main length growth has taken place in early summer." Such applications kept the trees from going into the rest period too early, and maintained a green and healthy condition throughout late summer and autumn without renewing the growth in twig length. It may also be noted that in the English work, at the Woburn Experimental Fruit Farm, July applications proved beneficial, while those made in February were of no avail.

An incidental advantage of the delayed application appears in the fact that it gives an opportunity to vary its rate somewhat in accord with the size of the crop set on the trees. When the crop is light, much smaller applications are required, because of the natural tendency of the trees to develop a sufficient number of fruit buds in the off season. Proper utilization of this fact should save much in a series of years, and also enable one to secure the maximum return for the fertilization applied.

In the case of the mineral ingredients, with their lower solubility and slower action, the time of application is less important. Some of the most careful observers in commercial work regularly apply their phosphates and potash in the fall on their peach orchards, and believe that this gives best results. Thus far, however, we have felt that the time of application for the minerals is of relatively little importance, since they are rather quickly fixed in the soil, in any case, and they do not leach readily. We therefore, apply them along with the nitrogen, at the time we consider best for it.

The method of application that we have followed is merely to scatter the fertilizer or manure broadcast over the surface of the ground, taking care not to get it too close to the tree trunk where there are few absorbent roots, and extending the applications well out beyond the spread of the branches. To conform more closely with the distribution of feeding roots, the rate of application is made heaviest in the central part of this area, or in general it is applied heaviest under the outer two-thirds of the spread of the branches. This fertilization may either be left on the surface to be washed in by the rains or it may be harrowed or lightly plowed into the soil. With all this done, it should be remembered that the fertilizer applied in any given season can hardly materially affect the yield in that year, since the fruit buds are formed in the latter part of the preceding season. Important results therefore, should not be expected before the following season, at the earliest, and as indicated in some of our experiments, they may not appear until considerably later and still prove of value.

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*See Proceedings of the Society for Horticultural Science 1911, p. 37.

Determining the Actual Needs of an Orchard.

The general fertilizer formula indicated above is for use only until the exact needs of the particular orchard can be determined. In other words, it is intended to meet only immediate demands. If in the meantime one wishes really to answer the question of how to fertilize his own orchard, he can do so by following the plan outlined in Table VII. This plan is especially adapted to the needs of commercial orchardists and to "community" tests on the part of the smaller growers.

Table VII. Plan for Local Orchard-Fertilizer Test.
(*Pounds for a Mature Tree in Bearing.*)

1 Check. Untreated.
2 Niter, 2½ lb.; D. Blood, 3½ lb.; Ac. Phos. 10 lb.
3 Niter, 2½ lb.; D. Blood, 3½ lb.; Potash 2 lb.
4 Acid Phos. 10 lb.; Potash 2 lb.
5 Check.
6 Niter, 2½ lb.; D. Blood, 3½ lb.; Ac. Phos. 10 lb.; Potash 2 lb.
7 Same as VI, plus Lime, 12 to 25 lb.
8 Manure, 400 lb.
9 Check.

This plan should be located in a typical part of the orchard, and should include not less than five average trees of the same variety and age, in each plot. All the trees should be labeled and carefully measured at a fixed point on the trunk, and definite records of their growth and yields should be kept for at least three years. Frequently good indications of the orchard's needs may be obtained in less time than this, as is shown above in the Johnston and Brown orchards, but at least this amount of time should be allowed and more should be used when necessary.

The same time and methods of application and other precautions should be followed as described above. The materials are indicated here in amounts per bearing tree instead of per acre as above and the same reductions should be made for younger trees. In other words, if only a third of the ground is to be covered, then only about a third of these amounts should be used, if the rate of application is to be kept within proper bounds.

These general precautions, together with the exercise of proper judgment on the part of the grower, are entirely sufficient to carry this plan to a successful conclusion and definitely settle the fertilizer needs of any ordinary orchard within a few years. If additional rules and precautions are desired, however, they can be found in the Annual Report of the Pennsylvania State College for 1910-11, pages 409-11. In addition, it should be remembered that an orchard may not show the need of a fertilizer when young, but may develop this need later, especially when heavy bearing is reached. This means that the cases that appear negative at any one time often need further tests and attention later.

Discussion.

E. C. Tyson. Would the result in the Brown experiment indicate that phosphoric acid might be eliminated from the applications?

Dr. Stewart. No, it does not. It simply means that you are not likely to get the benefit from an application of phosphoric acid alone that you would when applied along with some other material, unless you should happen to have an abundance of all other necessary elements. Then you might get it by applying phosphoric acid alone.

Mr. Bassett. Is that in Pennsylvania, Professor?

Dr. Stewart. It was in one part of Pennsylvania. The soil in this particular case had been cropped heavily for a long time and was very much exhausted. I might say for Pennsylvania soils, however, that we have averaged about thirty bushels of wheat to the acre for the past twenty years on the College Farm that is run in connection with the Experiment Station, which will probably compare favorably with similar averages in any other state.

Mr. Bassett. I was afraid you were slurring the state, that was all.

Dr. Stewart. There is a difference in the way even good soil may be handled. Notice, however, that even in this soil, the best trees in the orchard are the ones planted in the old sod pasture with a spade. No cultivation before planting nor since. One hundred pounds of straw to the tree were used as a mulch for the first two years. Since that time the growth between the trees has been sufficient to maintain a mulch. These trees that were just planted in sod were not permitted to have grass growing over the roots, however, and that is the thing we must emphasize. Grass growing over tree roots is objectionable and is bound to stunt the trees. Where we have grass growing over tree roots we usually get the poorest results that we can get anywhere. But where we keep the grass growth down with mulch without any cultivation, we get the excellent results you see here.

This and other similar results raise the question as to whether we have not over-emphasized the necessity of stirring the soil about the roots of trees. The natural condition for tree growth is with an undisturbed root system, and it is a question whether the tillage of trees has not been over emphasized, especially so far as it applies to apple trees.

Question. Does that hold good in peaches?

Dr. Stewart. I would not want to say, because our opinion is that the peach needs tillage much more than the apple, and until we get some definite basis for changing that opinion we will let it stay as it is. I should not be surprised, however, in view of these results, that a person could also develop a very satisfactory system of mulching and fertilization for peaches as well as for apples.

While we are on this question of young orchards and cover crops, I want to call your attention to some of the figures we have here. We have tried thirteen different cover crops with the results indicated on the chart. Notice the best of these has been alfalfa, when used as a permanent cover and a mulch. We do not let the alfalfa grow over the tree roots, however. You see the percent. of gain is 206. The next best is vetch which has 160%. The third in value to the trees is crimson clover; fourth is rape, which we have recently changed to a combination of rape and cow-horn turnips. Then comes millet. Millet, I am inclined to think, has a lot of virtue as a cover crop that it has not been fully credited with. Some of these others, soy beans, etc., are far down in the list.

Of course we can't guarantee that this will happen everywhere, but that is what is happening in our experiment at the Station. We are getting very good crops of the beans and also of cowpeas and other annals, but the trees are not showing any particular benefit from these crops, and the fact that the crops themselves are so good may help to explain what has checked the growth of the trees.

Vetch comes out just as expected. It is much superior to the other annual covers, probably largely because its moisture draft is so low. It also fixes nitrogen from the air.

W. E. Grove. Have these crops been fertilized?

Dr. Stewart. They had one uniform fertilization and received an application of lime once.

C. J. Tyson. Has the culture of the soil been uniform?

Dr. Stewart. The culture of the soil has been uniform in all cases except alfalfa. The alfalfa is a mulch proposition and was cultivated but once, at the beginning of the experiment, to get the alfalfa started.

R. A. Wickersham. Are these crops ever allowed to grow over the roots?

Dr. Stewart. Yes, in the case of the annual covers, they grow up pretty close to the trees. That is as close as ordinary crops are usually sown.

In this connection it seems to me one of the most important things we can do now is to work with different plants to find out which is the best one to grow as a permanent cover crop. That is, to find out which is the best crop to grow in connection with the mulch system, and how best to handle it.

R. A. Wickersham. Do you leave all the alfalfa lay where it drops?

Dr. Stewart. We do not leave any of it remain where it drops. We rake it up and put most of it around the trees. When we get too much to put around the trees it is hauled away.

Mr. Bassett. What percent. of the total nitrate and minerals required by the fruit is contained in the seed?

Dr. Stewart. I can't answer that. I have collected analyses of fruit and its parts from all over the world, and none of them have distinguished the seed composition sufficiently well to enable one to answer your question accurately. It is safe to say that the percent. is comparatively high, however.

Mr. Bassett. If the fertilizing value is in the seed, then does not a bushel of cider apples really reduce the fertility more than a bushel of fancy apples? I want to prove that it pays to thin fruit. I want to establish that idea.

Dr. Stewart. You are quite right about that, in my judgment.

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PEACH PACKING AND PACKAGES.

Prof. M. A. Blake.

Mr. President, Ladies and Gentlemen:

I think I would like to change the wording of my topic a little, to "Harvesting and Packing of Peaches." As our time is short, I will try to cut my talk down and make it as brief as I can.

First, I would say that the work the Experiment Station has been doing in New Jersey, in regard to peach growing in that state, is to try to solve the problems of peach growing. The station has peach orchards in two different parts of the state. We pick, pack, and market the fruit, the returns come into the state and are turned over to the state. We do not pretend to say that all of these problems we try to solve are new. In fact, all of them are pretty largely handled by the fruit grower. The idea is to help the average man and to try to help the leading man in every way possible. Try to co-operate with them and we think that is the best method to accomplish results.

When it comes to the harvesting, marketing, and packing question, of course we must say that the locality has a good deal to do with the problem, so that these remarks that I will make this afternoon are given to you for what they are worth. And if I give you an idea here and there that will do you some good I shall be glad of it.

Peaches can be graded and packed in the open air without shelter, but to my mind, if one has an orchard of any size, it is necessary to have a packing-house, not only because you are protected from the rain, but because the work can be done much more rapidly and cheaper.

One thing that has been found in some of our local markets in New Jersey, is that too little attention is paid by fruit growers to the uniform ripeness, grade and quality of fruit sold. We all know that the perfect peach is only secured by being fully ripened on the tree. The peach must be ripe before it is picked to have the full flavor.

I have gone into markets in local towns in New Jersey where there would be peaches that would not be ripe for a week and some would be over-ripe in the same basket. This is not advertising our home-grown crop in the right way. It is often necessary to sell the second grade fruit in the local market because it is not worth while to ship it, but it should nevertheless be graded according to maturity, size and quality. Where large quantities of fruit are shipped it is often impossible to get the highest grade of fruit grown in that locality. It is easy to tell by the color of the fruit when it is ready to pick. We have had some experience in hiring Italians to pick peaches, and it seems to be the rule with those we are able to obtain in southern New Jersey that they want to test the maturity of the fruit by pinching with the fingers and we find it a problem to get them to pick it according to its color.

The common commercial package that has been used in New Jersey for a good many years, is the so-called Delaware peach basket, as illustrated by Fig. 1. This package, however, is going out of use in New Jersey, especially the southern part of the state, except where they can haul the peaches in to market by team, such as to Philadelphia and other points.

Let us consider for a moment the qualities desired in a commercial package for shipping. First, the package should be cheap; in the second place, it should be light, and it should be strong and durable. A package that is easily opened or broken into is not desirable. Fruit in a package of such size that it can be thrown easily from one man to another is more likely to be damaged than fruit in a heavier package. The box and the basket should be arranged somewhat, the grade should be the same all the way through. Oftentimes the commercial package of a district is the package used for picking. The objections to the Delaware peach basket as a shipping package or for a picking package, are that the baskets are not always well made, and accidents will occur; there is also a tendency to throw them sometimes when they are being loaded into a car rapidly. And when it comes to the matter of a cover for shipping this package, a burlap or a wooden cover is used. I think that the burlap cover should be discarded in all cases, unless for a local market. I have seen baskets of peaches ready for market, piled one above another with nothing between the fruit in the top of one basket and the wooden bottom of another except the burlap. The wooden cover is much to be preferred to the burlap cover as it will give more protection to the surface of the fruit.

Fig. 2 illustrates the Delaware basket with a so-called wooden cover. This cover will protect the top of the fruit much better than burlap, and is less easily removed in transit, but in order to prevent this package being slack when it goes into the market, it has to be very full and tightly packed. From the standpoint of the New York market, this package is not very well liked by the New York commission men. The same grade of fruit in this commercial package will not sell as well as in the Georgia carrier. On an average we have found that when a basket will sell for 75 cents the same grade of fruit will sell at from $1.50 to $1.75 in the Georgia carrier.

The Climax basket, Fig. 3, is another package used for peaches, and probably more in Ontario, Canada, than elsewhere. This package is easily opened and is not very satisfactory as a shipping package.

Fig. 4 illustrates the so-called bushel basket package. We have used it somewhat experimentally but it does not serve the purpose as a shipping package for New Jersey conditions. Too large a bulk

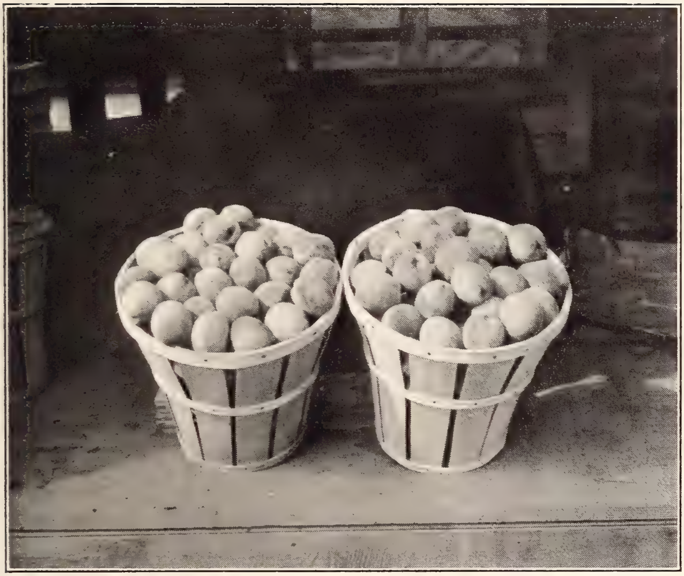

Fig. 1. Delaware and Jersey Baskets Filled With Elberta Peaches.

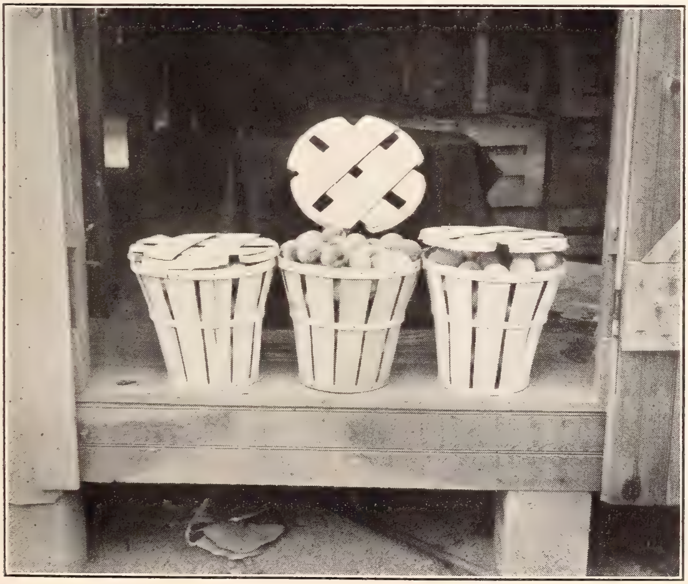

Fig. 2. Delaware and Jersey Baskets, With Wooden Covers.

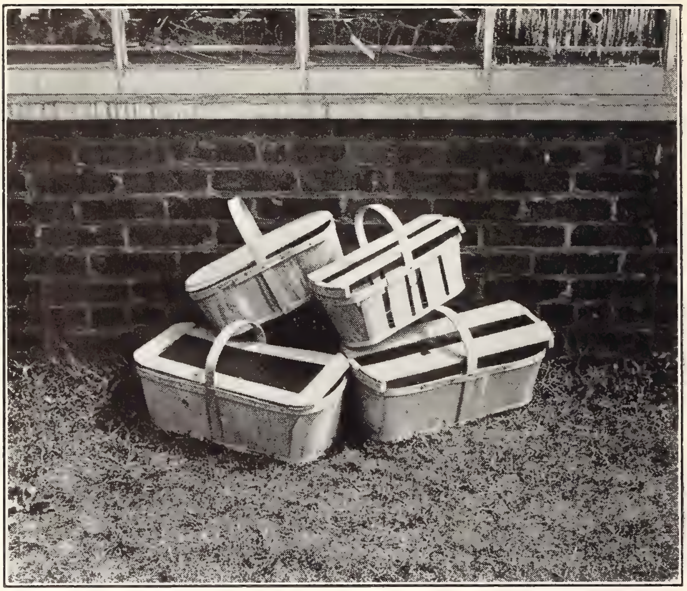

Fig. 3. Types of Climax Baskets.

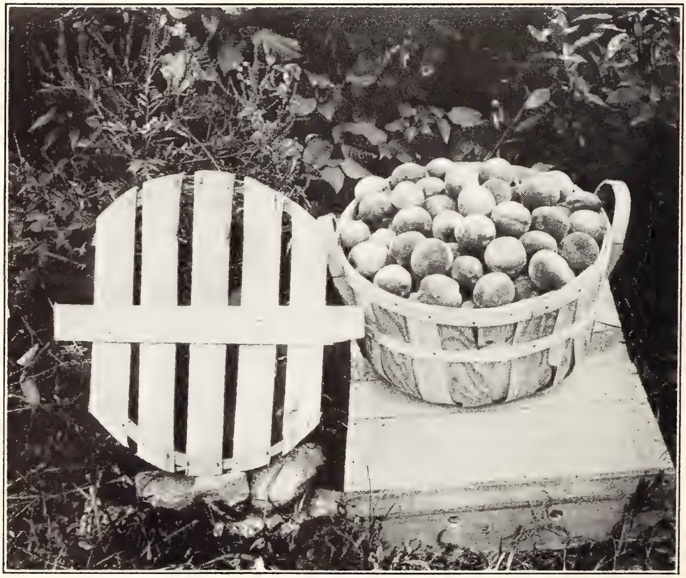

Fig. 4. Bushel Basket Package.

of fruit is contained in one space and the covers are sometimes removed and the fruit stolen.

Some fruit has been shipped from our experiment orchards in the California fruit crate, illustrated by Fig. 5. This is a style of package where the individual fruit receives attention. The pack is the same all the way through and every peach must be the same grade and size to make a desirable pack. Commission men have told us that it did not sell well when used for eastern grown peaches, and that in the New York market the people believed it was California fruit, and that the Georgia carrier was to be preferred. So far as the prices we received for fruit in this package were concerned, however, they were practically the same as we received for the same grade of fruit in Georgia carriers.

Fig. 6 illustrates the Georgia peach carrier with which you are all familiar. This package has been gradually taken up by the growers in the southern part of New Jersey as the best shipping package. These packages as they come packed with fruit from Georgia, contain six baskets. The fruit stand men usually take the fruit out of these six baskets and fill up seven smaller tills. These carriers, as they come from the south, are new, and when the fruit man takes the fruit out as soon as received, they are hardly stained and are in good condition. These crates prove a bargain to some peach growers about New York and Philadelphia because they can secure them from 5 to 6 cents each.

When the matter of packing peaches in such package as the California fruit crate or the Georgia carriers is considered, we need to have fruit that is of the same size and grade. If we have large, small and medium sized fruit on the same tree and harvested at the same time, the work is necessarily slow. We need to grow fruit of uniform size to have it pack well. One of the first things to consider is the thickness of the setting of the fruit on the trees. I have in mind a grower in New Jersey who had a tremendous crop last season. The trees were planted 22 feet apart each way six years ago and this year the trees were simply bent double with the crop before the fruit began to color. He was inclined to thin the fruit, but was persuaded by others not to do so, with the result that he had a hard task tying the trees up so that they would not be ruined by breakage, and the fruit was not nearly as large as it should have been. When we have a heavy set of fruit on the trees it ought to be thinned. In most cases we can say that no two fruits should be closer than four inches apart. Some varieties, however, are much smaller than others, and need to be thinned even more severely. I do not mean to recommend thinning where there is only an occasional cluster of fruit upon the tree, but where there is a good set of fruit through the tree in general, thinning should be resorted to. The work of thinning should be done about the time of the so-called "June drop," when we can determine which fruits are weakly pollinated, or affected with curculio or have been blemished in some manner. It is very easy to thin the fruit upon well pruned trees.

Thinning often seems like a waste of fruit, but the specimens left on the tree will be of much larger size, and this becomes especially important when there is a large crop and prices are low except for the best grades.

Fig. 7 illustrates average fruits taken from thinned and unthinned Greensboro trees a season when prices were not very high. The large fruit at the right in Fig. 7 sold readily but the small sized fruit from the unthinned trees at the left was hard to move. Unquestionably, thinning is an important part of the peach business. Fruit properly thinned, especially the Elberta, will nearly all pack into the same grade. I have seen lots of Elbertas packed in New Jersey and some in Georgia, where at least 75 per cent. of the fruit would all go into one grade.

I hope that few of you have trouble with peach scab in this vicinity. We know that this can be controlled by proper spraying with self-boiled lime-sulphur. Wherever there is scab there is likely to be considerable brown rot also, and this of course adds to the number of culls on the packing table.

The following system of summer spraying is now generally practiced by successful growers in southern New Jersey. Arsenate of lead, 3 pounds to 50 gallons of water, just as the petals fall. A second spraying of arsenate of lead and self-boiled lime-sulphur is given just as the calyx is being shed from the fruit. Where there is much injury by curculio, the first spraying is quite important, for as soon as the peach reaches the size of a large green pea so that the calyx begins to come off, the curculio begins to feed. On varieties like Greensboro, that ripen early, two sprayings of self-boiled lime-sulphur three weeks apart are generally sufficient, but mid-season and late varieties should have at least three sprayings to prevent scab and rot.

I took the opportunity this summer to visit the peach section of Fort Valley, Ga. I thought no better section could be selected to observe methods of packing and shipping. I was entertained by Mr. J. H. Hale and had a most pleasant and profitable trip. The land about Fort Valley is generally flat and easily cultivated. From my observations this valley appears to be the garden spot of Georgia.

In the Fort Valley district a spur track is run out from Fort Valley to the large orchards and iced cars are delivered right at the packing houses. I found the general cultural and orchard management conditions there about the same as elsewhere. There are growers who fail to adopt the best methods, just as in other peach districts. There are growers about Fort Valley who fail to appreciate the importance of summer spraying, and in one large orchard which I saw, the fruit was badly scabbed and rotting rapidly. The weather conditions in the south this year were very favorable to rot, and this accounts for the fact that at times the market was very unsatisfactory, because much of the fruit would not stand up after it reached the dealer.

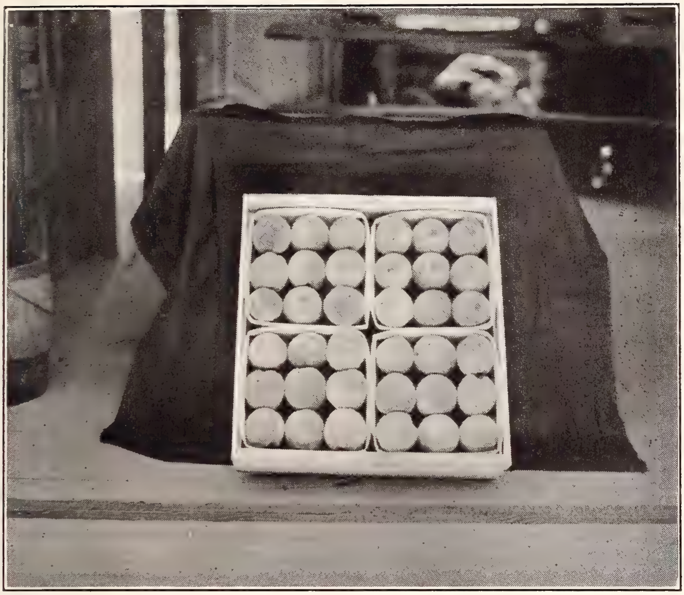

Fig 5. California Fruit Crate.

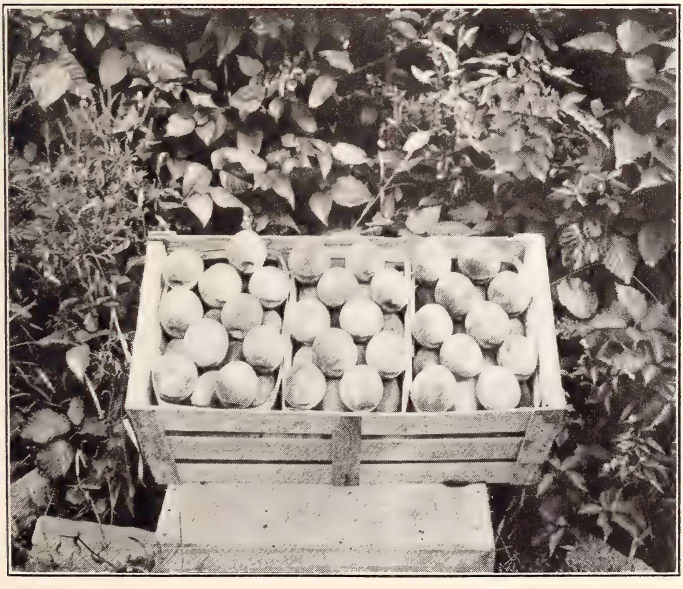

Fig. 6. Georgia Peach Carrier.

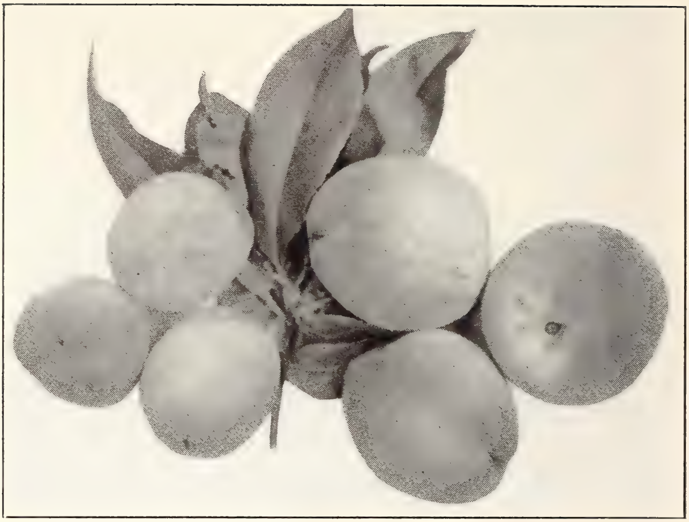

Fig. 7. Average size specimens, from an unthinned peach tree (on the left) and from a tree thinned 4 inches apart (on the right).

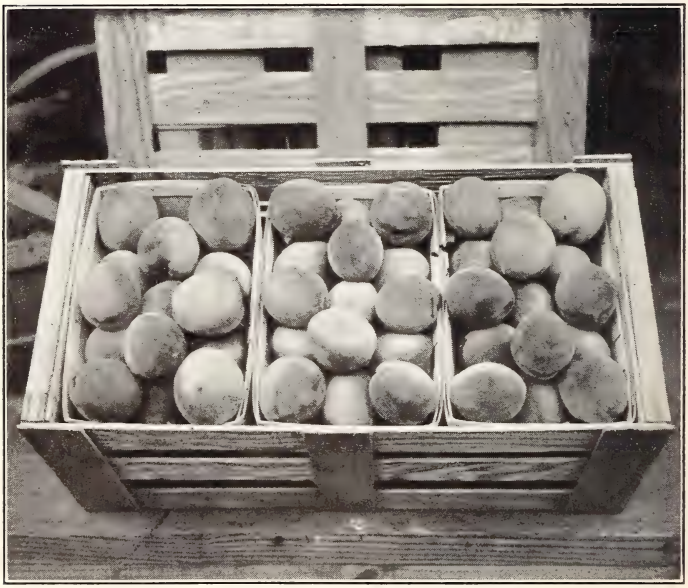

Fig. 8. A, 2-1, 3-Tier Pack in Georgia Crate.

The trees in Fort Valley district are pruned to form low heads, and when the fruit is ripe and the trees well loaded, the branches bend down and the fruit is picked from the ground. Colored labor is the help that is largely depended upon for picking, and in some cases for packing, and also for loading the cars. In Mr. Hale's orchard, at the time I visited it, there were about 100 college students employed, most of them from the University of Georgia. Many such boys work in the packing houses and are paid in such a manner that those who do well are encouraged to stay and by the time the main crop comes on most of the poor packers have left.

Mr. Hale employs a ticket system to determine the amount of work done by each picker and grader, and when these tickets are checked up at the end of each day, the superintendent has a record of how many baskets each grader has handled, and how many baskets each girl and each man has picked. I tried the ticket system in the harvesting of our fruit in our experiment orchard at Vineland and found it a very good plan. Each picker had a card, and during the first day's picking, a basket of fruit reached the packing table which was too green, and by referring to the card in the basket we found it had been picked by No. 17. A little later another basket was found with the fruit somewhat green and the ticket showed picker No. 17. It was only necessary to shout out to the orchard foreman that No. 17 was picking the fruit too green. The man in charge of the packing house can tell exactly what sort of work each picker is doing. This system also seemed to bring out some rivalry among the pickers to see which could pick the most. We had one man as a picker who was a school teacher, and when the records were footed up each day we found that our school teacher was picking more peaches than any of the Italian pickers.

I was somewhat surprised to find that most of the colored laborers at Fort Valley seemed to receive practically as high wages as the Italian labor we have in southern New Jersey. I found some of the colored laborers at Mr. Hale's very bright. In taking a photograph of several men loading peaches upon a wagon, one of them remarked, "Look out boss, don't take my feet or you won't have no picture."

One of the important things in packing a Georgia carrier is to have it full enough to give the cover a noticeable bulge, a point which the amateur packer often fails to get onto.

I want to bring up one or two suggestions with regard to the expenses of marketing peaches from various points. The distance from Fort Valley, Ga., is eleven or twelve hundred miles. The freight by the carload is about 55½ cents, the cost of icing would be about 16 cents, and cartage in New York about 5 cents. An empty crate in Georgia will cost not less than 15 cents, when nailing, labeling, etc., is considered. Compare these expenses with those from Vineland, New Jersey, to New York. Distance to New York, about one hundred miles; freight 14 cents; cartage 5 cents. The crates, if new ones purchased from eastern dealers, might cost 20 cents, but if they were ordered direct from the south by the carload, the cost might be cut down somewhat.

Consider the difference in the cost of marketing peaches from these different points. There is much complaint here in the eastern districts about southern and western competition, but a glance at the above figures will show that the grower at a distance is under heavy shipping expenses, and the eastern grower really has a marked advantage.

I have tried to encourage peach growers to form organizations whether they did any buying and selling or not, simply for mutual benefit. Growers about Hammonton did so, and a little later in the summer, at the time of peach shipping, they complained of the freights being very late.

I suggested that the association take up the matter with the railroad and to write to the Experiment Station giving us details, and we would take it up with the railroad also. This was done and about three or four weeks later I wrote to the President of the Association and asked him about results. He said that the freight service had been so much better that he had written the freight agent a complimentary letter. The desired results were accomplished by a proper presentation of facts to the railroad. It seems to me that if all of us who are interested in these things in any one state would co-operate and take them up in the proper way, we could accomplish the desired results.

The Georgia carrier to one who has never packed it may seem to be a formidable package, but it is a good deal like the apple box. We need to know how to pack it and just what pack to use and then it is not so difficult.

In most of the packing houses the packer simply packs. The empty crates are piled up behind him, and as soon as he packs a crate he sets it down on the floor and some one else takes it away. He takes an empty crate from the pile and goes on packing. The packers should be under the ticket system also. First class packers are said to be able to pack 200, 225, and sometimes 250 crates a day of eleven hours, at Fort Valley. The men whom we employ in our experiment orchards at Vineland averaged at the rate of 280 to 300 crates a day of ten hours, when packing Elbertas the past season.

Fig. 8 illustrates the 2-1 three tier pack. This pack does not look quite as compact as some of the straight packs, but will insure the arrival of the fruit in better condition. Fig. 6 illustrates the 2-2 three tier pack which is desirable for the medium grades. The 2-1 pack is the best style for the larger fruit. No straight packs should be used for peaches in Georgia carriers.

The question has come to us a number of times as to whether it would pay to wrap peaches, so we wrapped several lots and sent them to market to see what the result would be, but failed to get a much better price. If we were sending a special package a long distance, perhaps the wrapping would help to protect the fruit, but under present conditions I do not think it will pay in the east.

The question of labels is another important matter in peach packing and marketing. We encourage our growers in New Jersey to use labels. I know from experience that a label is very desirable if one is selling uniform and high grade fruit.

As I stated at the beginning of my lecture, some of these marketing methods that have been discussed may not apply to your conditions, but I trust that they have been interesting and will stimulate new thoughts and ideas.

Question.—What is your formula for self-boiled lime-sulphur?

Prof. Blake.—I use the standard 8-8-50 formula, that is 8 pounds of lime, 8 pounds of sulphur and 50 gallons of water. It is always prepared, however, in quantities of about three or four times the standard formula.

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GRAPE GROWING AND ITS POSSIBILITIES ON A GENERAL FRUIT FARM.

MR. LLOYD S. TENNY.

Mr. President, Ladies and Gentlemen:

I come with a little hesitancy to talk to you on the culture of the grape. It is not one of our large crops. However, as I understand the conditions in this county, you are not contemplating going into the grape industry on a large commercial scale. It is a question of the possibilities of the small vineyard for home use. It is along that line that I am going to give you a sort of a rambling talk this afternoon.

First, as to soil: you will need a well drained soil. After that you have said about all that is necessary. Some of the very best vineyards are on soil we would call comparatively heavy. Our vineyards at home are on a soil of this quality. I have never been able to see that the quality which we have been able to produce is inferior on account of the type of soil we have. So I say if you have a soil on which the peach or many varieties of apples will do well, you have a soil which will answer well for grape growing.

Varieties.—There is no fruit that offers greater possibilities for one who loves varieties than grapes. It is a fruit that takes but little room, the number and wealth of varieties is immense, and if you desire to encourage the love of classification of fruits in yourself and children, there is absolutely no fruit that will surpass the grape. We have difference in color an difference in the type of growth. There are shades and delicacies of flavor, hard to surpass, in the grape. Commercially I would advise just about two varieties of grapes for our locality. I would say 75% of the vines should be Concord and the other 25% should be Niagara. I appreciate the fact that some would change that around, and some would put 50% of each and some would add other varieties. I am talking from my own personal knowledge. These two are more easily grown than most of the other varieties and the net returns are decidedly the best. The Concord will bring more money. However, the Niagara crowds it closely, and on some soils you can get larger clusters and a better type of fruit. The Niagara is the leading white grape and the Concord the black one.

Here are some other varieties—The Delaware does splendidly in some localities and the Catawba does well in places. It is a late grape and if you have difficulty in ripening the Salway peach you might have difficulty in ripening the Catawba grape. Rogers varieties are subject to diseases and are difficult to grow, and I would advise amateurs at least to keep away from most of the Rogers varieties. The Hartford Prolific is planted in some localities, but I would not advise it. There are, as I say, a host of other varieties. I would stick to the old time variety—the Concord— adding as I saw fit more or less of the Niagara.

The vines should be planted in the spring. We get good strong vines, usually two years of age. A few years ago we secured two-year Concord plants for 1c. each, You cannot do that now, but the price is not large. Plant comparatively deep. Have the soil just as you should have it for all sorts of fruit, in a fine condition, so that the plants may readily take root.

That means a moist soil. I have seen vineyards put out in a very dry condition, where it was necessary to carry a little moist earth to put around the roots. The hole was then filled with earth that was almost dry. As to distance apart, possibly I will not give what would be the best distances to plant the vineyard commercially, but I should say that the rows in your vineyard should be amply wide to allow a spring-tooth harrow to go through between the rows with two feet to spare. That will give you seven or eight feet distance in the rows. About eight feet is my preference between the rows. Personally, I believe in giving all of our fruit a good deal of space. You will get finer fruit and your yield per acre will be larger if you do not crowd your vines and trees.

Some people get along permanently without trellises. For the first two years you can tie the vines to a stake, but by the beginning of the third year you should have a wire and post trellis. You can find many different methods, consequently you will find some people training to one wire, some to three wires, some even using as high as five wires. I have seen quite extensive commercial vineyards where as high as five wires were used. I prefer either the two or the three wire trellis. To persons who desire to grow fancy fruit I should advise the three wire method.

Just a word as to how to construct the trellis. The first wire will be two feet from the ground, the second will be 20 inches above, and the third wire about 20 inches above that, that would bring the top wire somewhere in the neighborhood of 5 feet.

Some portions of the stem are perennial and from these parts there are grown each year, the canes which will bear the fruit. The perennial parts remain an indefinite time, some times as long as thirty years or even more. We have them as old as this in our own vineyards and I cannot see but that these old portions produce as healthy bearing wood as the young vines. Let me repeat that the fruit is borne on parts of the vines which grew the year preceding. There is a portion of each vine which does not bear the fruit but which produces the wood each year and it is on this wood that the fruit is.

With the three wire system, the perernial part of the vine comes to the lower wire and here divides, one old cane going to the right for about four feet and another part going to the left for an equal distance. On the the right hand portion two canes are left each spring which will produce the fruit on that half of the vine. These canes extend from the perennial part, which runs along the bottom wire, in an upward direction to the top wire. The two bearing branches will be about two feet apart. The perennial portion on the left side will also have two bearing canes on it, making four in all for the vine. About half way between these four canes will be four other new growing canes each summer, which in turn will become the bearing wood the following summer. No doubt many of you will wonder if these four canes will produce enough fruit to make it worth the while. As a matter of fact, too much fruit will be produced on them and it will be necessary to thin out some of the clusters in the early part of the summer. Once again let me impress this fact upon you. A single vine will need no more than four bearing canes, each cane being about four feet in length. Each summer must see four new canes being grown on each vine to replace the four then producing the fruit. It is a continuous process.

Pruning.—Prune early in the spring before the vine has made any growth. The pruning consists largely in cutting out the portion of the vine which produced the fruit the preceding year. In pruning, it is necessary to see that the four new canes are present and in case there have been others growing, these should be cut out when we prune. In cutting off the canes that produced the fruit the year before, it is well to leave one bud, which will furnish the growing part for the following summer.

In the spring, after your trellis has been repaired, your posts reset and wires tightened, you tie those four canes to the horizontal wires. Tie first to the top wire. In former years we used four-ply twine. We tied the cane sufficiently tight with the four-ply twine so that it will not move with the shaking of the wind. However, in recent years we have replaced the four-ply twine with a very fine stove-pipe wire. I have not seen that used very much in the commercial vineyard, but it has proven satisfactory with us. We hold one end close to the wire and wind it first around the wire and then twice around the vine and wire. We buy the wire in the rolls and have them cut into three sections. This gives us a wire about 6 inches in length. After tying the top, then we go through, taking a four-ply string and tying tightly around the middle wire sufficiently tight to keep it from swaying with the wind.

Let me give you another system of training your vines. This is a two-wire system. It is a little bit more economical in building the trellis, which instead of having our perennial part horizontally placed, we put it up to the top wire. Now that is perennial and does not bear fruit. We leave that there from year to year, and along the lower wire, running to the right 4 feet, we have a young cane to produce the fruit, and also on the left a young cane comes out to produce fruit. Along the top wire we have a similar cane. This is just turning the process around. The bearing wood is wound loosely around these wires and tied, to keep it from unwinding. Now, the objection to this system is this: there is a tendency for all the fruit and the young growth to become tangled around the horizontal wire instead of hanging free where they may be cut easily in the fall without being torn to pieces.

In the upright system, you have the fruit hanging over a greater surface, freer and more apart from the other bunches, and it is more easily sprayed, so that in general you are getting a finer type of fruit with that system than under the old time two wire system.

When the growth starts in the spring there is too much growth there, and you have to do a process of summer pruning. The grape is one of the things that we do prune in the summer. Usually two buds, or sometimes three buds are starting to grow, and we do not want but one there. We have a process called rubbing off, whereby all the growing shoots but one are taken off.

The grape is peculiar in that the fruit produced next season is on wood that is not yet grown. These upright canes produce the fruit but they do not produce it directly. They will produce it by sending out laterals. After those laterals have grown out a leaf, they put out a fruit bud, then they send out another leaf and another fruit bud.

Each bud will put out a good normal shoot, which, under good conditions will produce two, three, or even four clusters of grapes. Now, if you want to produce fancy fruit, all of these clusters except one or two should be rubbed off. The three and four clusters usually are small ones, and if you allow them to go on to maturity the grapes will not be large. If you want to you can figure how many clusters you are going to have on your vine. You have four canes each about four feet in length. If the nodules are about six inches apart on each one of the canes, you would have about seven or more laterals coming out, and on each of those you will have two clusters, so you would have somewhere from twelve to fourteen or even twenty clusters on a cane, making from sixty to eighty clusters per vine. If those are large clusters you are going to have a pretty large yield. That is the fruit that is usually marketed. Let me urge the importance of growing large clusters.

Cultivation.—You must have a very thorough clean cultivation; you cannot grow grapes in sod. I have never yet seen a section or a locality where you could grow grapes successfully in sod. They need thorough cultivation. Have all your winter pruning done before the buds have pushed out any. The vines are very subject to bleeding. Like the maple the sap flows out very abundantly. But it does not do that if the trimming is done before the growth starts. Cultivate once a week whether it rains or not. If you should have a light shower after you cultivate, cultivate again, so that you always have a dust mulch over the surface of your soil. The grape needs lots of water in the soil. I do not believe there is anything more I need say with regard to the cultivating methods. A word or two in regard to the diseases and method of spraying.

We are fortunate in our locality not to have many grape diseases, so I can't give you very much information along that line. I remember though as a small boy that it was about the time that the black rot of the grape manifested itself in the country and wrought such havoc, and we knew no method of controlling it for several years. As a youth, I had to go out to pick off the rotten grapes. We would put them in a bag, empty them in a basket at the end, and take them off and burn them. We took every precaution we knew how to take without avail. We now know that black rot can be controlled by Bordeaux mixture. Bordeaux mixture will control it absolutely. We cannot use the commercial lime-sulphur spray in the vineyard as the grape is more susceptible to injury than peach foliage. I have not tried self-boiled lime-sulphur. Do not know with what success it has been tried. I am of the opinion it has never been very successful.

There are certain other diseases that occasionally get into the vineyards and are very serious. We do not have them in our locality. I cannot tell you definitely how to control them from my practical experience.

Marketing.—If you begin to harvest your York Imperial apples about the first of October, Concord and Niagara would begin to ripen about the first of September. However, the summer weather very materially affects the ripening of the grape.

We continue to harvest all through September till frost comes. It is not uncommon for a vineyard with fruit still on to be caught with an early frost. Late spring frosts, in some localities, do a great deal of damage. If the little buds are killed in the spring, you are killing in a large measure, the crop for that season. The grape is not so delicate, however, as the peach, with regard to spring frost.

You do not pick the grapes all at one time, you pick over the vineyard several times. You pick as to ripeness, and that means when the color has reached the standard for that variety. The grape will not ripen any at all after it is severed from the vine. You must allow it to ripen on the vine in order to produce good quality. It is like the peach in that respect, probably more so.

Your method of picking will almost entirely depend upon your marketing facilities. Now, with us, our fruit goes direct on wagons to the Rochester market, consequently we do not do any packing at all. We pick in 18 or 20 lb. market baskets without any grading only as we grade when we pick. Our pickers know that the very poor clusters are to be left on the vine. The clusters are simply laid in the market basket, until it is rounding full. That is a simple and cheap method. Some people pack in smaller baskets. Some in two or three pound splint baskets. They take them into market and sell to grocerymen in a basket that is retailed to the consumer. The fruit in the larger baskets is sold to the consumer by the pound. If, on the other hand, you ship by railroad, you must use the Climax basket with a wooden cover. Load it in the car in that way. The basket that is more often used is the small 4 or 5 lb. Climax basket.

A fair yield with us is 18 tons of grapes from about 5 acres. It has not been uncommon in the past for us to run over that, and it is not uncommon for us to run down to 15 tons. If you sell in bulk and allow the buyer to pack, as is done in some localities, you cannot afford to grow them for less than $35.00 or $40.00 per ton. However, $30.00 per ton with a big crop, probably will bring a larger return to the farmer than wheat or general fruit crops. When you get above $40.00 your returns, of course, are good, and if you can get $50.00 the profits are splendid.

The grape is a fruit that is easily handled as to the fertility of the soil. Thorough cultivation with an occasional cover crop, will maintain the fertility of the soil for 40 or 45 years.

Question. What do you fertilize with?

Mr. Tenny. That is a very good question which I neglected to cover. Not a pound of commercial fertilizer and only an occasional thin coating of stable manure has been used in our vineyards for over 40 years.

W. H. Black. What is the best variety for early use?

Mr. Tenny. I think that the best we have on our place is Moore's Early.

The Brighton is a very good grape. It is rather delicate with us to market. It is a little subject to cracking and liable to rot. The clusters are very large. The Worden is another fine black grape. If you are going to have a home vineyard the Worden should be in it. You cannot ship the Worden by freight successfully.

J. W. Prickett. When is the proper time to spray to prevent rot?

Mr. Tenny. Begin soon after the growth starts and keep it up. If you have rot in your vineyard, spray as frequently as once every week or ten days. If you do not have the rot, two or three sprayings during the season would keep your grapes in good condition. Some advise spraying in the dormant season with lime-sulphur. We have so few diseases that we have not thought it advisable to do that.

J. W. Prickett. Does it control the rot, do you think, to spray in the dormant season?

Mr. Tenny. I am afraid not. It might assist in controlling it, but you could not depend on it. If you have the rot bad in your vineyard it is a question of eternal vigilance.

M. E. Tyson. How about a little green bug that attacks the vine and eats out the bud?

Mr. Tenny. It is probably the flea beetle. It is a bright bluish green in color. Arsenate of lead will control it at 2 lbs to 50 gallons of water.

THE CHESTNUT BLIGHT.

Mr. Keller E. Rockey, *in charge of Demonstration Work, Pennsylvania Chestnut Tree Blight Commission.*

In 1904 the diseased condition of the chestnut trees around New York City was noted, and an examination of them showed that they were being attacked by a fungus disease which was unknown at that time. It has since been found that the disease had been present there and elsewhere for some years before that time, but is impossible to determine when it first appeared. The disease was studied and classified during the winter of that year. It was placed in the genus *Diaporthe* and named *Diaporthe Parasitica,* making it a new species of a genus which contained only harmless fungi. The disease is commonly called the "chestnut blight" or the "chestnut canker disease." It is a fungus or a low order of plant life which grows upon the cells of the bark and to some extent the wood of the chestnut tree. The disease advances in each direction, the tissues of the cells are broken down, the flow of sap is cut off, and the tree killed by girdling. The disease is spread to other parts of the tree and to other trees by means of spores. These spores are of two kinds, called for convenience the summer and winter spores, although both types are produced to some extent at nearly all seasons of the year. The summer spores may be seen coming out from the pustules in small threads after the manner of paste squeezed from a tube. These threads are yellow, about one-quarter of an inch long, and are forced out shortly after a rain. These spores are readily dissolved in water and wash down the trees, infecting them in other places. They are sticky and carried, to some extent, by insects. The winter spores are shot out into the air when the bark is soaked after a rain and are disseminated chiefly by the wind.

On display here are specimens and photographs showing the appearance of the blight so that I will not go into that part of the subject in detail. I hope, however, that you will notice: 1st. The small, red pustules which bear the spores and appear only in the crevices of rough barked trees. 2d. The peculiar mottled appearance of the inner bark of the canker with the fan-shaped mycelium. By either of these characteristics, the disease may be identified.

In scouting for the chestnut blight there are danger signals which make the work easier and more accurate. A canker, especially on smooth bark, will very shortly discolor the outer bark, turning it from green to reddish brown tint. On young growth the cankers cause a hypertrophy or swelling which is very evident as you will see by the specimens. The bark over the cankers usually cracks open and a closer examination will reveal the pustules growing in the crevices, or the characteristic inner bark. The most evident danger signal, however, is the wilting of the leaves upon branches which have been girdled by the blight. As soon as the branch or tree is girdled the passage of water from the roots of the tree is shut off and the leaves begin to droop and soon take on their autumnal coloring. While a branch bearing withered leaves is not conclusive evidence that a tree is infected with the blight, such branches demand a closer inspection, and in the vicinity where the blight is working are nearly always caused by the disease. In the winter the same signal is observed in the withered leaves and undeveloped burrs which persist on certain trees or branches. It has been found by our men that they can cover more ground and do better work after the leaves fall than in the summer, because the light shows up the cankers along the trunk, and the unusual branches, leaves and burrs are seen more clearly. Under a canker usually appear sprouts which are caused by the daming of the sap which is deflected to the growth of such sprouts. A small cluster of sprouts along the trunk of a tree is unusual unless the blight is at work immediately above. Further investigation will show whether or not this is the case.

All of these features can be seen in the display and a careful examination of them will make any man competent to look over his timber and determine very closely the amount of infection on the trees.

The Bureau of Plant Industry in Washington has been investigating this disease since 1908. In the spring of 1911, a bill for the investigation and control of the chestnut tree blight disease in Pennsylvania was passed and the work began in August, 1911. The method upon which the commission is working consists briefly in determining the area of blight infection and in removing diseased trees west of a certain line with the purpose of preventing the western spread of the blight. The commission has obtained as accurately as possible the amount of infection in the various parts of the State and the results are given in a map on display here. The State is divided into two districts by a line along the western edge of Susquehanna, Wyoming, Columbia, Union, Snyder, Juniata and Franklin Counties, which is approximately the western line of serious blight infection. West of this line a large portion of the State has been scouted and the remainder will be finished early in 1913. Blight infections have been found in counties adjacent to this line, also in Fayette County, near Connellsville, Warren County, near Warren, and in Elk County, near St. Mary's. These three infections were directly traceable to infected nursery stock and in one case the blight had spread to adjacent trees. A large area of diseased chestnut in Somerset County illustrates the harm done by shipping infected nursery stock. The center of this infection is a chestnut orchard, where about 100 scions from an infected eastern orchard were grafted to native sprouts in 1908. Evidently these scions brought the disease into this region for the grafts have all

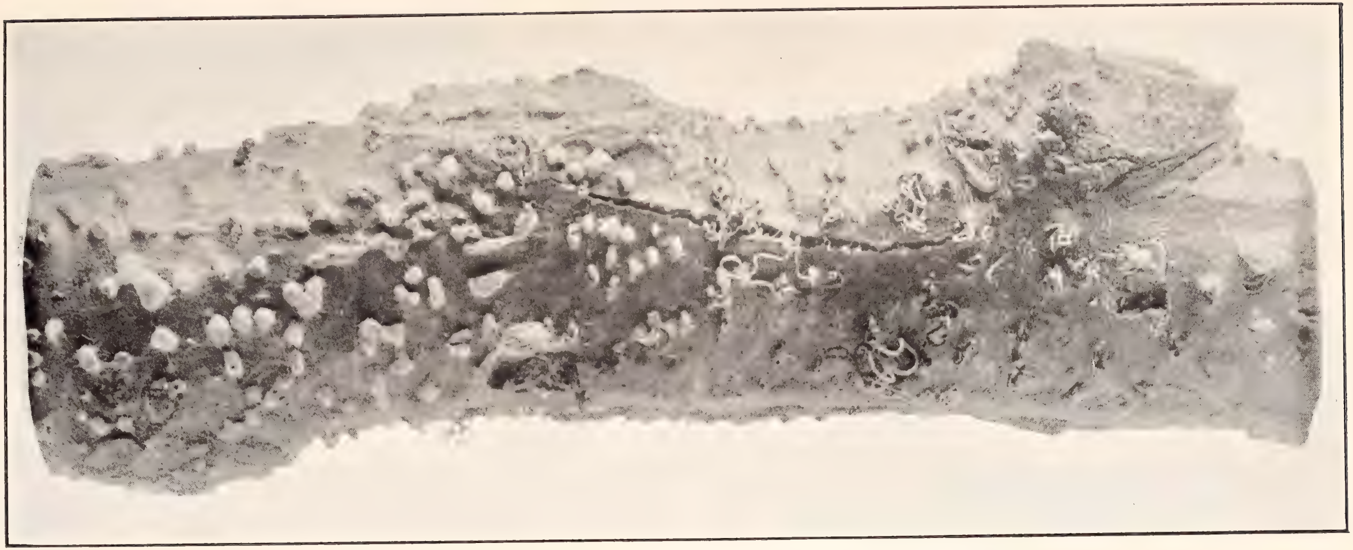

Fig. 3.—C. T. B. C. Branch Infected With Blight (enlarged).
Note wart-like pustules and summer spore threads.

been killed by the blight and every tree in the orchard is killed or affected by the disease. On adjoining tracts over 5,400 infected trees have been cut and there are a number of others in process of removal, radiating in all directions from the orchard as a center to a distance of three miles. In other words, since 1908, the few cases of infection brought into this orchard have spread three miles at least and more than 6,000 trees have become infected.

Another infection of 143 trees was found in Elk County. These infections are interesting in showing the rate at which the blight may travel in healthy timber. It is thought that three trees at the center of infection were diseased in 1909, although it is possible that one of these trees was already infected in 1908. In 1910, 27 additional trees were infected; in 1911, 50 additional trees, and in 1912, 228 additional trees. The disease spread in all directions from the center of infection to a distance of 700 feet. The same rapid spread has marked the progress of the blight everywhere. A few infected trees upon a tract will mean more infected trees in each successive year until the stand is completely destroyed. In many stands around Philadelphia it is hard to find a healthy tree. Unless some action is taken that will be the condition in this locality.

These infections have all been removed and it is the expectation that by the end of January, 1913, all scattered spot infections will be removed from the territory west of the line previously mentioned, and that, to the best of our knowledge, these western counties will be free from blight. In 1913 the field force will be concentrated on the advance line and the work will be carried eastward. The commission has the power to compel the removal of infected trees. In the western part of the State this was used in the few cases where it was necessary. As a rule, however, the owners are not only willing but anxious to get rid of the infected trees, and our field men are given hearty support by individuals, granges and other organizations. The timber owners of Elk County had printed and posted an announcement that the chestnut blight had been found in the locality and warned the people to be on the lookout for it.

On the other hand, the commission has deemed that it was only just to place agents in the eastern part of the State where the ravages of the blight are most seriously felt. The commission has had an agent for a short time at least in each of the eastern counties of the State but their time has been taken up principally by those who requested an inspection of their timber with the view of determining the amount of blight infection and the best method to be pursued in combating it and realizing on the timber.

This display is a part of the educational work which is being carried on for the purpose of acquainting the timber owners with the appearance of the blight disease. A similar exhibit was made in about thirty of the county fairs of the State and the appreciation of the public was so clearly shown that next year it is the intention of the commission to continue and perhaps increase this phase of the work. Many of the Teachers' Institutes now going on were reached by a display and lecture, among them the Adams County Institute. We have arranged to have a speaker at fully one hundred of the Farmers' Institutes this winter, among them New Oxford and Biglerville. We are arranging also to have a public display at many of the public schools and colleges, where instruction in the blight is given.

Publications which go into the subject more fully than is possible in this paper can be obtained free of charge upon request. The commission advises the cutting of infected timber for the following reasons: 1st. Infected trees will be rapidly killed and the wood of such trees deteriorates very rapidly. 2d. Infected trees allowed to stand means the certain spread of the disease to surrounding trees, resulting in the death of the whole stand in a few years. 3d. It will mean the loss of valuable material through decay and insects.

If the owner of chestnut timber land in this county does nothing he may expect to lose every chestnut tree and he will most likely find that after this time the timber is in such bad condition that it will not pay to take it out.

Every man who owns a chestnut tree should learn to recognize the blight and then look over his trees. Upon request we will try to send a man to help determine how much blight there is, and help mark the infected trees.

The infected trees can be made up into whatever is most profitable; every farmer can use a certain amount of chestnut in posts, and cordwood each year, and probably manufacture some ties and poles at a profit. In this way he can utilize the infected trees that should be cut, and get rid of them, which is the chief consideration. Beyond this he must bark the stumps to the ground and burn the bark over the stumps. By cutting a low stump this is not an expensive undertaking and the sprouts will be healthier and more vigorous. If it is not done the sprouts will eventually all become infected and unless other species come in to take the place of the chestnut no revenue will be received from the land for the next fifty years.

It should not be understood that one cutting will be enough to eradicate the blight entirely unless all chestnut trees are cut. On the other hand, it will probably be necessary to go into the stand the following year and cut out more trees, but if the work is properly done, the second year the number of trees will be fewer and after several years the blight should be completely cleared out. This means an effort on the part of timber owners, yet in this way he is utilizing his material and he is encouraging the growth of the trees that are left. Thinnings are often made for this purpose alone. In many places in various parts of the State timber owners go together, each promising to take care of his own timber, and as a consequence the whole district is being cleared of the blight. Such an organization for mutual protection will be given every encouragement and all the help possible by the Pennsylvania Chestnut Tree Blight Commission.

Where the blight percentage is high it would often be wise to make a clear cutting of chestnut and if there are other species in the mixture perhaps the chestnut could be eliminated, and the land stocked to other species. In many cases the chestnut is being clear cut and the ground planted to pine, spruce or hardwood trees.

The commission has established a Department of Utilization, which is collecting information on the various industries which use or might use chestnut, listing the buyers and owners of chestnut, and assisting the owners of blighted chestnut in marketing the timber to their best advantage. The department is trying to increase the demand of chestnut by calling attention to its many good qualities, and thus utilize a large quantity that must necessarily be thrown upon the market. In spite of the large amount of blighted chestnut much of which is being cut the market price of chestnut lumber in many places throughout the State looked for a drop in price, but instead are confronted with an increase of from $1.00 to $3.00 per 1,000 feet within the past three months. There is at present a very good market for first and seconds, No. 1 common and sound wormy, in inch boards and all sorts of dimension material. Chestnut owners need not be afraid to cut their timber into different grades of lumber because there is a ready sale for material of this kind.

There is a good market, also, in almost every locality, for poles and ties. Cordwood presents a difficult problem of disposal. The best market for this is in the central part of the State at the extract plants the nearest one being at Newport, Perry County. The commission has secured from the Pennsylvania Railroad a special tariff on blighted chestnut cordwood so that this product may be profitably shipped from greater distances than before.

Although the chestnut wood has only about 65 per cent. of the heating value of good oak, it makes a good summer fuel, since it makes good kindling, burns rather quickly, and does not produce the lasting intense heat that oak does. A good argument for using chestnut instead of oak or hickory for fuel is that the small chestnut might in a few years be killed off by the blight while the oak, hickory, etc., will grow in value.

There has been more or less discrimination against blighted chestnut. This has been in many cases unjust since the blight does not appear to injure the value of the wood for most purposes for which it is used. However, the owners sometimes fail to realize that blight cankers are favorable places for the entrance of wood borers and that where a large number of trees are being considered a percentage of them may be materially injured by insects. This is a secondary result of blight infection. When telephone poles are barked it is often seen that borers have attacked the wood under blight cankers and have not touched any other part of the tree, and these cankers are attractive spots for wood destroying fungi. Telephone poles cut from trees which have been dead for some time are very apt to be rejected.

The question of quarantine is often brought up. The commission has inspected all chestnut nursery stock shipped from nurseries within the State and has provided for inspection of all such stock entering the State. This should prevent a repetition of infections in the western part of Pennsylvania which might destroy millions of dollars worth of timber. It has also prohibited the shipping of unbarked chestnut cordwood from the eastern part of the State across the advance line. There is no other quarantine on poles, ties or other barked material across this line, nor a quarantine of any kind upon any material shipped from place to place east of this line.

The State Foresters are cutting the blighted trees over the neighboring State reserve, of 20,000 acres. The Reading Railroad owns several thousand acres of timberland adjoining the Adams County line and the State Reserve, which is in the same condition as so much of the timberland around this vicinity. Repeated fires have occurred after the first cutting and no revenue has been received from the land for the last 10 years. The growth is of very poor quality and the stand in a bad condition. Some of the trees have become blighted and the railroad saw that unless they did something the whole tract would become a waste. They have seen that their agent became familiar with the blight, have had him inspect the timber and remove the infected trees. They have done more than this. They have seen that such work would not be fully justified unless they expected to realize something on their timber, so they are now making an effort to prevent fire, which is the other big enemy to timber land. In such a way the blight will be beneficial in forestry just as the San Jose scale has proven itself beneficial in the fruit industry. Taking care of the blight will necessitate better methods and more attention to the growing timber and help the State prepare for the timber famine which is coming within the next 50 years.

The chestnut in Pennsylvania is the most valuable timber in the State, when all things are considered. It is the most abundant, grows most rapidly, sprouts well and will grow in very poor soils. Seventy million dollars is a conservative estimate of the value of the standing chestnut in the State. Adams County has its share of valuable chestnut land.

Can you afford to lose the chestnut timber? From the studies made in Adams County it appears that there is an average infection of only 4 per cent. In York County the infection runs about 50 per cent. What I wish to emphasize is that this county has a good chance to entirely eradicate the blight. The amount of infection is not high. There are numerous portable mills all over the chestnut area and even the market for cordwood, the only product difficult to dispose of, is good.

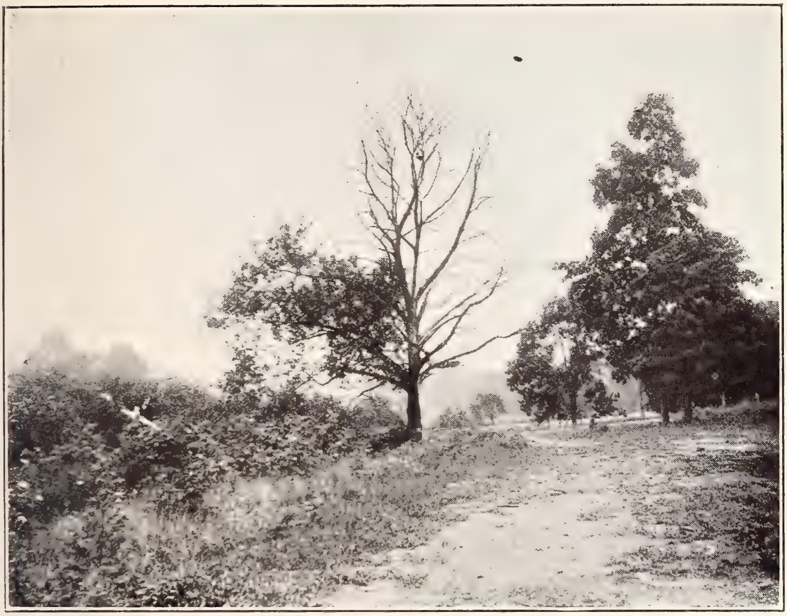

Fig. 1.—C. T. B. C. Blighted Tree Partially Killed.

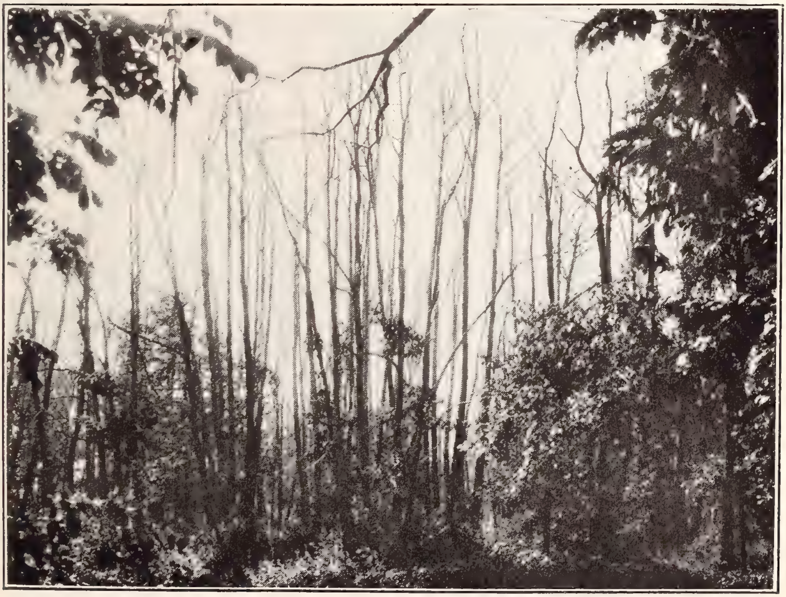

Fig. 2.—C. T. B. C. A Stand of Chestnut Entirely Killed by Blight.

Every tree which has the infection at any place should be cut because that tree will eventually be killed and by being left it is afforded an opportunity to throw out spores continually.

Valuable orchard or ornamental trees may be treated by cutting out the canker, disinfecting and painting the wound. A bulletin, which goes into this subject in detail, may be secured free of charge upon request.

In southern Europe chestnut orcharding is a well-established and profitable industry. In the United States chestnuts have been considered a marketable commodity ever since the Indians carried them to the settlements and traded them for knives and trinkets. The demand has always exceeded the supply, and at the present time about two million dollars worth of nuts are imported from Europe annually. With the development of the better varieties of the nut has come an increased activity in American orcharding. The chestnut orchard industry promises to become one of very large importance, especially upon the poorer types of soil.

At the present time there are in what is known as the Blight area of Pennsylvania, which includes about one-half of the State, about 100 orchards from 12 trees up to 400 acres in extent. These orchards are in varying stages of blight infection, some of them being entirely free, due to the attention which has been given them.

The blight came as a very serious blow to this industry. Some of the orchards have been completely annihilated and the income reduced from several thousands or more dollars per year to nothing. Whether or not the blight will completely wipe out the orcharding industry is a subject of considerable discussion. Personally, I believe that chestnuts will be raised commercially in Pennsylvania in increased abundance, and as the various phases of the blight subject are brought to light, the work of keeping the blight under control will be more easily and accurately done. At the present time the blight is being kept under control in some orchards by examining the trees often and by treating an infection as soon as it appears, or cutting out the tree. If this policy is successfully pursued for several more years it will be demonstrated conclusively that chestnut can be grown in spite of the blight and this will mean an opportunity to use vast areas of waste land in Pennsylvania in a highly profitable manner. The results which have been attained in other fruits by selection and hybridization in recent years have been noteworthy. Certain pure strains of Japanese and Korean chestnut seem to be resistant to the blight and it is not unreasonable to suppose that we may eventually see an immune hybrid chestnut of good size and quality.

Discussion.

W. H. Black. How general is the infection in Adams County?

Mr. Rockey. I understand it runs about 4 per cent. as an average. In some districts it will run as high as 25 per cent. It just depends on how bad a start it happens to get.

Mr. Tenny. Does this bark fungus gain entrance to a healthy tree or must it come through a wound?

Mr. Rockey. It has been said that the infection can enter without a wound of any kind, but such instances are very rare. If the tree has healthy bark all the way through, it would stand a much better chance of remaining healthy. The natural cracks in the bark are not so susceptible as those made by outside means. I might say that downstairs we have several cards, and if any of your people would like to have an inspection of your timber, and if you will write your name and address on the card, the agent will come around and see you. If you have only three or four trees on your property that are infected you can see that it will pay you to remove them so that next summer you will not be confronted with fifty more.

Mr. Williams. Is there any cost to have this done?

Mr. Rockey. That is absolutely free of charge. In the eastern part of the State is where the timber owners are losing the most money. The commission thought it was only right to do what they could for these people. For that reason there is no charge at all. None of the work is compulsory in this locality.

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COVER CROPS AND THEIR EFFECT ON THE SOIL.

Dr. Lipman.

In discussing cover crops this morning I shall attempt to answer four general questions. In the first place, what are cover crops? Second, what advantages may result from the use of cover crops? Third, what disadvantages may result from the use of cover crops? Fourth, how may cover crops be used for the improvement of the soil and the crop?

As to the first of these questions, there is more or less misunderstanding or confusion as to the meaning of the term or terms "cover crops", "green manure crops" and "catch crops". Logically, a cover crop is any crop that will prevent leaching or erosion. That was the main purpose in the growing of cover crops. It was intended to have a crop on the soil during a certain portion of the year to prevent the washing out of soluble plant food or the erosion of the surface soil if the topography be rolling. A green manure crop, most of us understand, is a crop that will take the place of animal manure to some extent. It will increase the content of vegetable matter, and also it might add to the plant food content of the soil. Green manure crops will, in other words, increase the content of vegetable matter out of which humus is made. And finally, a catch crop is a crop that may be used as a cover crop. The catch crop may be harvested or plowed under. The green manure crop is intended to be turned under, so that there are really important differences in the character of each crop. Recently we have come to understand cover crops to mean green manure crops, sown not merely to protect the soil but to add something to the soil.

As to the next question: what advantages might result from the use of cover crops? In studying the history of cultivated land we find that there is a tendency for such cultivated land to deteriorate in quality. Stating it briefly, any soil that is placed under cultivation, produces, in its new state, large crops which gradually decline. Then after a time if the markets, population and other conditions justify it, that land will be improved again and will be made to produce more than the virgin soil ever produced.

Some of you may have read a little book, "The Farmers of Forty Centuries," that was published by the late Prof. King, of the University of Wisconsin, regarding his travels in China and Japan. It shows in a very striking way what the soils which have been cultivated for thousands of years have done in supporting a very large population. We know that our soils must deteriorate under prevailing practices, and it must come to pass in the development of any agricultural territory that there will be a decline from a higher to a lower state of production. There must come a time when the fruit grower, dairyman or any other type of farmer will have to think of ways and means to maintain the fertility of the soil and to improve the fertility of the soil, and when he reaches this point he will be confronted with certain questions he must answer if he is to accomplish the purpose which is before him. He must answer the question as why soils deteriorate. They deteriorate because they lose a larger or smaller portion of their available plant food, and therefore, cannot furnish the growing crop with building material as fast as the crop may need it for profitable production.

Soils may also deteriorate not because they lose too much plant food for profitable production, but because the texture of the soil itself has deteriorated. Instead of being open and mellow, permitting conditions that would favor the circulation of air and moisture, the soil has become compact and the moisture does not penetrate as it should. The farmer who is able to answer these questions is also able to find the causes that lead to soil deterioration, and he is ready to seek then for remedies that will enable him to counteract these tendencies. If you examine one hundred soils from any territory that has been under cultivation for a generation or more, and try to inquire into the deficiencies of these soils, you will find most of them deficient in the element nitrogen. The next largest proportion will be deficient in phosphoric acid, some will be deficient in potash and there might be many deficient in lime.

In a soil deficient in nitrogen, a cover crop could be used to restore the nitrogen, hence it behooves the fruit grower to use cover crops that will restore this element. If the soil has deteriorated in texture because it has lost too much of its vegetable matter, he must use cover crops to restore the vegetable matter that has been lost. These points are recognized well enough in the use of cover crops, but there are two or three other facts that are not as readily recognized.

Why is it that a soil left to itself tends to grow more productive? It has been the impression in farming districts in Europe and elsewhere, that soils must rest, that soils that are allowed to rest will regain a portion of their fertility.

Indeed, there are still localities in Europe where the land is allowed to grow up with weeds for a few years so as to recover some of its lost fertility.

Why is it that some of our best soils are prairie soils? The vegetable matter accumulating, plants growing and dying, and growing again, produce in time a deep layer of vegetable mold. Why is it that some of our best soils are forest soils? These forest soils when cleared of their timber growth, are able to produce large and profitable crops for some years, as shown in Pennsylvania. Why is it that when we analyze any cultivated soil, we find certain forms of plant food concentrated in the surface soil?

We find that the surface soil contains more phosphoric acid than the sub-soil.

We can understand why there should be more nitrogen in the surface soil, for it is all of atmospheric origin, but we know that the phosphoric acid or the lime or potash are derived from the rock out of which the soil is made. The answer to this question may be found evidently in the explanation that the roots of plants go down into the sub-soil and bring up certain parts of the plant foods found in the sub-soil. In other words, we must recognize the fact that there is constant loss from all cultivated land or even from land that is not cultivated, as well as gain. That is true of all soils, but when land is placed under cultivation the losses exceed the gains. When land is allowed to rest, allowed to be occupied by vegetation, then the gains are greater than the losses and the soil has time to become richer.

We cannot maintain a satisfactory texture and likewise satisfactory plant food conditions unless we provide for the maintenance of a sufficient supply of vegetable matter in the soil. This cannot be done unless animal manures are used or green manures are employed. Commercial fertilizers are not sufficient. Hence the significance of cover crops. First, cover crops will prevent the washing out of soluble plant food. Second, cover crops will increase the content of plant food in the surface soil, particularly nitrogen. Third, cover crops will increase the content of vegetable matter in the soil and will improve the water-holding power of the soil. Fourth, cover crops will provide for a larger store of moisture in all sections where snow falls and is likely to drift, and in the case of orcharding cover crops have certain advantages which they have not under other conditions of providing for the sustenance and growth of the fruit trees when that may seem desirable to the fruit grower. I will discuss that at greater length presently, because it is an important feature from the fruit grower's standpoint.

We need not discuss the loss of plant food at this time, perhaps, nor need we discuss the moisture relations as modified by the holding of snow.

In the purchase of plant food we recognize that nitrogen is an expensive constituent of commercial fertilizers. We also recognize that cultivated land, whether in orchards, fields or meadows, may lose a considerable amount of nitrogen. That is, where soil is cultivated, the loss may amount to 30, 40 or 60 lbs. a year. If we are to restore that amount of nitrogen at a cost of 25c, there is a value of $10.00 per acre that must be replaced. In cropping methods or types of farming where the crop is worth a great deal, $10.00 per acre would not mean very much, but even at that it is likely to be an important item. We know from experiments that have been carried on in most states, that the addition of nitrogen in cover crops may amount to as much as 100, 125 or 150 lbs. per acre. By selecting a cover crop of the right quality we can dispense with the need of purchasing nitrogen in commercial fertilizers. This, therefore, is one of the strong features in the use of cover crops, provided we use cover crops that will add nitrogen to the soil.

The deterioration of cultivated land which I mentioned a few moments ago, is due more to the lessening of the supply of available plant food rather than to the lessening of the supply of the total plant food.

Now, there is a point which most of us are likely to overlook. The soil of this portion of Pennsylvania contains, I should say, at least 2% of potash. You see that you have a very great accumulation of potash in these soils, and yet it often happens that the progressive fruit grower will use commercial fertilizers containing potash, and by adding 50 or 60 or 100 lbs. of potash will often get a return from this small amount of fertilizer. There are differences in the quality of the potash in commercial fertilizers and in the soil, but if we found means for making that potash in the soil available, is there any objection to our dispensing with the use of potash in commercial fertilizers? None at all. So far as the soil is concerned, the supply of potash is practically inexhaustible.

There is no claim that could be made as to the possible deterioration of the soil because of the removal of potash.

When we come to study the methods of "Farmers of Forty Centuries" that Prof. King refers to in his book, we are surprised at the cheapness of human effort. Farmers in China will take the soil off an acre of land to the depth of two or three inches, and grow a rice crop on the sub-soil. They will then return the surface soil which they had meanwhile comforted and will grow something else on it.

In the addition of nitrogen and vegetable matter to the soil, the two great functions of cover crops are before us, of adding and transforming plant food, aside from the function of conserving plant food in so far as the cover crop prevents leaching of soluble plant food during the Fall or early Spring. I will refer presently to the kind of cover crops we use and how they accomplish the purposes that we are considering, but I want to point out, before I pass on, that there are certain purposes in the use of cover crops in fruit growing that are a disadvantage rather than an advantage in other types of farming.

In looking at the apples on the stage this morning my attention was called to some spots on the apples which are supposed to be due not to any fungous, but to the physical condition in the tissue of the fruit itself caused by something in the soil on which that fruit was produced. The statement was made by someone that there was too much nitrogen in the soil. It is an old belief that when too much nitrogen is present in the soil the tissues will be more tender and the vegetation will be more rank and very much more subject to the attack of fungous diseases, and furthermore, that there may be a breaking down of the tissues. The fruit grow-

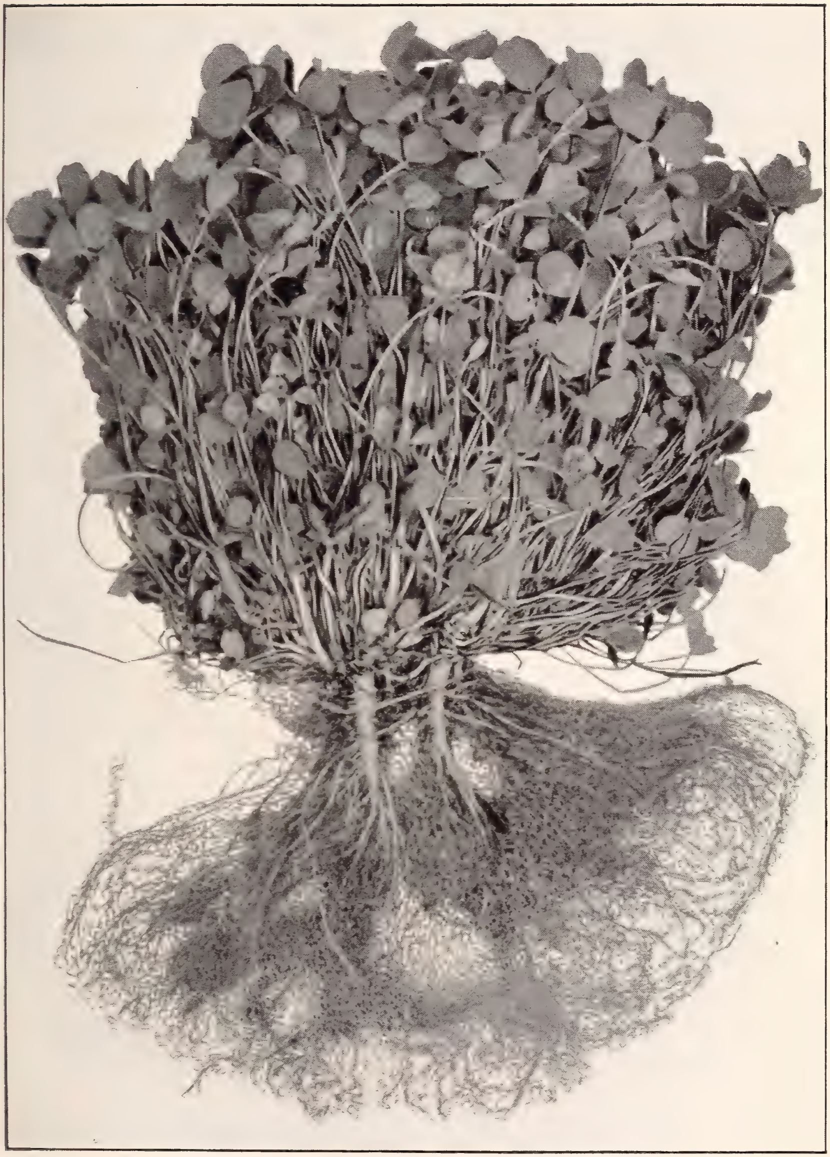

Fig. 1. A Single Plant of Crimson Clover.

er recognizes also, as every farmer recognizes it, that too much nitrogen in the soil is inimical to the production of a large crop of fruit.

I know a market gardener who used animal manure year after year. He finally reached a point where he could produce the crops that were formerly produced. He has been forced to learn that a large amount of nitrogen tends to force large growth rather than to encourage seed production, and when there is too much nitrogen in the soil it effects the wood and the fruit buds are not set as they should be.

If we use alfalfa or vetch or crimson clover as cover crops, we are apt to reach a point when the cover crops are likely to do more harm than good, because of the excessive wood growth, which is a disadvantage in the case of fruit. For this reason: the fruit grower will often resort to the use of cover crops for the special purpose of stopping the further development of tissue in the tree in late summer, and when he has that purpose in mind he will prefer to use barley or oats perhaps, rather than crimson clover, vetch, etc. In this particular case he wants to get out of the soil as large an amount of nitrogen as he can to prevent the soil from making that nitrogen and the trees from getting it, so as ripen and mature earlier in the season.

C. J. Tyson. Dr. Lipman, will you allow a question? In the case of cover crops of cowpeas, are the nitrates available to the tree and tree roots in the same season in which the growth has taken place, or is it necessary for the plants to decay?

Dr. Lipman. It may to some extent. This question happens to bear on investigations that I have been making for several years on the influence of what we call "associated" growth of legumes and non-legumes.

To answer your question directly, I should say that there is a gain even in the same season, but it will depend on other factors. In the case of cowpeas and soy beans grown with corn, in our experience the yield of corn was decreased rather than increased, because it happened that the season was exceptionally dry and moisture was the limiting factor. Before the trees could be stopped from lack of nitrogen they were stopped by lack of moisture in the soil. The corn had enough nitrogen but did not have enough moisture. I think that Hedrick has come to that conclusion that trees can benefit from legume cover crops.

So much for the advantages of growing cover crops. As to the disadvantages, I have already referred to one. That is the excessive forcing of wood growth. The soil is itself inclined to be deficient in phosphoric acid and potash unless provisions were made for using enough fertilizer during the season when the cover crop is being produced.

As to moisture, I think I have already referred to that and need not say anything more about it. We might pass on to the question, what could the farmer do to utilize cover crops in a practical way, to increase his crop yields? It is for the farmer to decide whether his soil is deficient in nitrogen or not. If the trees are making all the growth he thinks they ought to make, then it would not be wise for him to grow leguminous cover crops. He might better depend on barley, oats, or winter wheat and not grow legumes. There is danger of excessive wood growth. I remember an experience of ours in one of our experimental peach orchards at Vineland. This particular area of land of gravelly loam had been reduced to the point where it would not grow corn. It was soil that would be regarded as exhausted. We planted our peach trees there, and Prof. Blake, after watching them the first season said "I do not believe I would care to have more wood growth than the trees are making, and I should not care to apply any leguminous cover crop." I told him that, looking at it from the standpoint of the soil chemist, it was true perhaps, but it does not follow that next year or the next after you will not want to grow a cover crop. Now, we find that the trees that gave us the best returns were those that had received applications of nitrate of soda. They had too much nitrogen, or enough of it, earlier in their history. So when it comes to the practical application of the teachings on the value of cover crop, we must use our judgment in deciding what is best to use; whether they will make enough wood growth or not.

But on the other hand, he would be quite safe in using more legumes, and if he prefers his vegetable matter to die down and leave the winter cover dead, he might use barley. If you prefer something early in the Spring, he might use winter rye. If he feels that the soil is deficient in nitrogen, he has a number of legumes from which to choose.

What legumes could the fruit growers of Adams County, Pennsylvania use with any dependence, for increasing the supply of nitrogen as well as of vegetable matter in his soil? Winter vetch, clover or alfalfa. Alfalfa in this connection may be new to you, but I believe that with proper inoculation, alfalfa may be a very good cover crop. And of course cow peas, and soy beans should be included in the list. So we have not many legumes available for our purpose. Of all those that I mentioned, perhaps alfalfa and winter vetch are the most promising. For soils that are not well drained or inoculated, winter vetch would be the most satisfactory cover crop. Winter vetch has the advantage of being very resistant. In Michigan peach orchards winter vetch is regarded as the best cover crop. Winter vetch is hardy and does not depend on inoculation as much as does alfalfa, and will add considerable quantities of nitrogen and vegetable matter to the soil. It makes a very good cover and under favorable conditions, will form a solid mat. The amount of nitrogen added by winter vetch will range from 50 to 100 pounds per acre. Alfalfa is a promising cover crop, where the soil is deep and well drained, and properly inoculated, it will make enough growth in the early fall and spring to furnish a large amount of nitrogen. It will have the advantage of growing down deeper in the sub-soil than will vetch. Cow peas or soy beans might be used to advantage. I should prefer soy beans for this section of the country; they are more hardy, richer in nitrogen, and are not subject to blight to the same extent as cow peas. Cow peas will not require inoculation to the same extent but they will do much better in soil that is inoculated, than will soy beans. These can be used to advantage wherever conditions would permit.

In order to be able to utilize the cover crop to best advantage we must see that they make their growth. To make this point clear let me tell you of a personal experience of mine. I happened to be down in Monmouth County, N. J., in the potato section of that county. One of the potato growers showed me a field of crimson clover that was sown after the potatoes had been removed, on the 26th day of August. I was there on the 10th or 12th day of November, and there was a mat of crimson clover on the soil five or six inches high. The farmer said to me, "I am not at all concerned about winter killing. I have all the nitrogen and all the humus I need for next year, and if it is killed it matters little to me." Yet under the same conditions, crimson clover sown at the end of August might have made a growth of an inch or two. Why was there, in this case, so much growth? Evidently that potato grower had been using large quantities of fertilizer. He had a good soil and that crimson clover made more growth in three or four weeks than it would have made in another soil in two months. It is not a practice in this country to fertilize the cover crop. We expect the cover crop to shift for itself.

In Germany they recognize that they can profitably stimulate the growth of the cover crop. If we are to utilize a cover crop particularly its vegetable matter in the fall or early spring, as the case may be, we have to see that the cover crop finds the best conditions for its growth, and these conditions are particularly important to provide for when we are growing legumes. Legumes require a large amount of lime. The amount of lime might be enough for the apple trees themselves, but not enough for the cover crop. You might have enough phosphoric acid for the slow growing trees but not enough for the quick growing ones. So that in the practical utilization of cover crops you must make proper provision for the presence of lime, and for the proper inoculation of the land. These are the more important points in the use of cover crops and because of the great length at which I have discussed these points, I do not feel that it would be proper for me to discuss the matter any longer, except in so far as you may wish me to answer specific questions.

C. J. Tyson. Do you think it practical for us to try to save seed of winter vetch?

Dr. Lipman. Yes, if you could grow winter vetch with rye, or preferably winter wheat. Rye matures a little early for vetch. I think it is quite feasible to grow your own seed. Of course you will have to have rye or wheat with it to hold up the vetch and to get the seed. The only difficulty arises in the fact that when the wheat and vetch are grown together it is hard to separate them.

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SOME PROBLEMS CONFRONTING THE APPLE GROWER OF TO-DAY.

LLOYD S. TENNY, *Hilton, New York.*

Mr. President and Fruit Growers of Adams County:

The great aim of the apple grower of to-day is the same as that of most other lines of industry, namely, to make money. His problems, therefore, have to do with those things which make it impossible or difficult for him to make his living. We may divide these broadly into two classes; first those problems which have to do with the size and character of his crop and in the second place, those problems connected with the turning of his product into money, namely the marketing problems.

During the past years we have heard much about increasing the productiveness of our orchards. Our experiment stations have devoted most of their time in studying orchard management and the control of insect pests and plant diseases, or those phases of farming which tend to produce larger and better crops of fruit. It would not do to say that too much time has been spent in studying these phases of the subject but it is certainly true that too little attention has been given to the other side of fruit growing, namely the marketing problems. Even so there are certain problems still confronting the grower which have not been solved to the satisfaction of all. Of these I shall speak first.

With regard to the young orchard, there is still the problem of varieties. This is one, however, that has been cleared up considerably in very recent years. A few years ago, there was a feeling on the part of many of our best growers that it was better to try some new varieties and what these should be was a real problem. This idea fortunately has been pretty generally done away with and now we recognize that the safest rule to follow in selecting varieties for a new orchard is to choose only those varieties which have been well tested out for the section in which we wish to plant. This does not mean of course that one should never try out new varieties, but these untried ones should be set with the idea that it is an experimental orchard and should not be selected for large commercial orchards. So we fruit men in Western New York have gone back to planting such varieties as the Baldwin, the Rhode Island Greening, the Northern Spy and others of these old-time varieties. We know what these will do under our soil conditions and with our orchard management. Many other varieties will do well under different conditions but it is still a question whether they will do as well with us as they do in other places and it is a pretty safe rule to follow to plant only those varieties which cannot be surpassed by the growers in another section.

Then we also have the problem of laying out the orchard and determining the distance apart to plant. This too has been pretty generally solved in recent years. We are realizing that human nature is weak and that it is best to plant our trees the full distance apart without fillers of the same kind of fruit for it is very doubtful if one person in ten will cut out the fillers as soon as they should come out. Thus a few years ago we were setting our trees 20 by 25 feet or thereabouts, with the idea of taking out every other tree; now the tendency is to put them at least 40 feet in each direction. In the peach sections, many growers are using peach fillers and finding the practice is an excellent one for the peach trees will of themselves come out before there is much crowding. Notwithstanding the advice of many of our scientific men, this practice has increased rather than decreased, and nearly every fruit grower who has tried the system, likes it very well. Many of our growers are setting permanent trees farther apart than they did a few years ago and it is not uncommon to find an orchard set with such varieties as Northern Spy, Baldwin, or R. I. Greening, where the trees are 45 feet apart or even 50 feet. Where apple fillers are still being used, such varieties as Wagener, Wealthy, Alexander, Twenty-Ounce, and Yellow Transparent are being used.

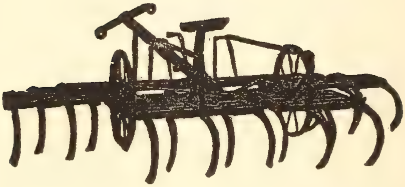
Another problem connected with the growing of the apple which is still unsolved in the mind of the average fruit man is the one of pruning or shaping the young tree. Our old orchards have leaders in the center. The western orchards from which we are getting our finest looking fruit to-day have open centers. Of these two methods of pruning a young tree, which is the better? The majority of us must confess that we do not know. A few things are very evident, however, as one visits the younger apple orchards in the various parts of the East. In the first place, the growers are heading their trees much lower than they did years ago. It is doubtful if the average head is placed much over two feet above the ground at the present time. Formerly it was four feet or even more. I believe that almost without exception, the best growers are not shaping their trees with distinct leaders in the center. A great many men, however, do not want the true vase-shaped form. They are rather leaving from three to five main branches, no one of them being of greater weight or importance than any of the others. The center of the tree is being filled more or less, as the grower may wish, with lateral branches coming out from these first main branches. Under this system it is possible to thin out the center of the tree whenever it is desired, as the branches which make up the center are comparatively small and unimportant and so may be cut out without detriment to the health and general make-up of the tree.

Now for a few words regarding the cultural problems in our orchards. Dr. Lipman has given us an excellent paper on the cover crops for our orchards. We all admit that cover crops are necessary, at least if we practice thorough tillage. For us in most sections of New York we have settled the matter that tillage is necessary, for without it we can neither get the crop of fruit nor can we secure the size of apple that will bring the most money. This much therefore is settled; we must cultivate our orchards and we must grow cover crops. Unfortunately, however, there are certain disadvantages that follow from these practices, chief among which is that the grower is not securing the high color on his fruit that he would like to get. This is a real problem and one of vital importance, for it is still true that the average buyer buys with his eyes and unless a fruit be attractive in color it will not find a ready market at a good price. Our problem is, therefore, how may we still till and grow cover crops and yet increase the color of our fruit. Possibly this may be done by the addition of some commercial fertilizer. Those who have done the most work on the subject, however, rather doubt this.

The common practice in tilling an orchard and putting in the cover crop is so well known that it is not necessary for me to describe it to you. I do, however, want to give you the outline of a system which is used by a few of our best growers and which may possibly help in solving this question of better color. The orchards are plowed very early in the spring. It is possible to use the disk instead of the plow if the owner prefers this method of getting his orchard under cultivation. The cultivation is very thorough all during the early part of the summer but it is not carried on to as late a date as is generally done. Just as soon as the leaves on the trees are very dark in color showing a good rank growth and a healthy state, then the owner stops his cultivation and puts in his cover crop; this may be as early as the first of July or even before that date. When the cover crop is sown as early as this, it generally gives good results and a good stand of clover is obtained. This in turn tends to stop the growth and to ripen the wood, which is a fundamental condition for good color. Frequently the cover crop reaches such a stage that it is necessary to mow the orchard once in the fall. The following spring the orchard is again plowed and the same process is repeated. The great objection to this method as I see it is that it will tend to give us an over supply of nitrogen from the annual growth of the leguminous cover crop. I doubt too whether it would be possible to use any non-leguminous cover crop when it is sowed as early in the summer as this is. At any rate, this paper does not try to solve this problem; it aims only to point out some of the greater problems which confront the apple grower of to-day. A broader view of this same problem is the production of a higher grade of fruit. This does not apply to color alone but includes also the finish of the apple as well as freeness form blemishes of all kinds and description. As competition becomes keener, that section will live where the greatest proportion of the fruit is of a strictly fancy grade, other things being equal.

After all I cannot believe that our greatest problem lies in the field of growing more or better fruit; rather is it connected with the turning of this fruit into more money. In other words it is a marketing problem, rather than one of culture. We are beginning to realize that the marketing of our fruits is a complex problem and one that but few of our farmers can solve. It is because of this that so many middlemen have become connected with our fruit business. Granting that they are all honest, which we know is not the case, even then the system of marketing through several middlemen is an expensive system and one not favorable for the grower to get the most out of his fruit. Some better system must be introduced. This is a problem which confronts the fruit growers in nearly every part of the country. The system that has solved the problem for the agricultural folk in several sections of the country is that of co-operative selling. The citrus growers of California control their own marketing system through the California Fruit Growers' Association. In this way proper distribution is obtained and top prices may be maintained. Before co-operation can succeed, however, we must have developed a better system of packing, for without uniform grading of a high character it is not possible for the growers to market their own fruit.

These are only some of the many problems that confront us as fruit growers. We can never hope to have all our problems solved; it is doubtful if we ever want to have them all solved, for a business without problems would scarcely offer the attractions for the intelligent young man whom we hope to have associated with us in this great industry of fruit growing.



ALFALFA.

Dr. Lipman.

Mr. President and Friends:

The Arabs came to Spain to destroy and occupy the territory that belonged to the natives. They brought with them a plant which by most of us is now called alfalfa. The Spaniards, when they went to the new world to look for silver and gold, brought seeds of alfalfa with them and left it along the western coast of South America to become acclimated and to find its way up the coast to the North. We find, therefore, that the spread of alfalfa in this country was from the west to the east, rather than from the east to the west, even though attempts to grow alfalfa were made in the east before the end of the 18th century.

The spread from the west to the east presents to us a very interesting story. For instance, in 1891 Kansas had 35,000 acres of alfalfa. Now Kansas has perhaps 1¼ millions of acres of alfalfa. In view of the soil enriching qualities of this crop, we can understand what alfalfa has done and even now is doing for Kansas, Colorado, Nebraska and California. But it is not only in the West and Middle West that alfalfa is doing great things for the improvement and enriching of soils, for near our own doors alfalfa has been becoming more and more prominent.

Only the other day I saw it stated in a bulletin from the Wisconsin Experiment Station that twenty years ago the crop was practically unknown in that State. But Wisconsin has now 25,000 acres and in the next three years will have 50,000 acres in alfalfa. In our own State, New Jersey, there were probably less than 200 acres of alfalfa ten or eleven years ago. Now we have between three and four thousand acres of alfalfa. Its spread in New York and Pennsylvania has been no less significant. Indeed, it is safe to predict that alfalfa growing in the Eastern States has passed the experimental stage. From now on we may expect to see the rapid spread of alfalfa and the enhancing of its reputation as a soil enriching crop. Its ability to restore worn out soils will be appreciated as fully as it was appreciated by the Romans who praised it for its health-restoring as well as its soil-restoring qualities. They referred to it as "Herba medica," the medicinal plant and fed it to animals that had lost their appetite. In South America, too, alfalfa has come to be a potent factor in agricultural development. Thanks to it the wild prairie is converted into arable land and rendered fit to grow profitable crops of wheat. In a word, then, alfalfa gains an enviable reputation wherever it is given an opportunity to demonstrate its value. Hence I shall attempt to point out this afternoon why alfalfa is a desirable crop and to outline the methods that must be followed in order to assure its success.

Alfalfa is a soil enriching crop because it has the power to increase the content of nitrogen in the soil. For example, we have raised seven tons of alfalfa per acre at New Brunswick. We had one ten acre field of alfalfa that gave us an average yield of six tons of field cured hay per acre. We expect to average at the College Farm, five tons per acre of field cured alfalfa hay. The average 100 lbs of alfalfa hay will contain 2½ to 3 lbs. of nitrogen, equivalent to 15 or 18% of protein.

After the removal of the crop there are left in the soil very large quantities of roots and stubble, which increase the content of nitrogen. Alfalfa is, therefore, a soil enriching crop because it adds nitrogen to the soil. Moreover it has another feature that is not recognized as widely. It has the ability to improve the soil because of its deep rooting habits, and because of its ability to open up channels which are followed by the roots of succeeding crops. Further arguments are hardly needed to convince us that wherever possible we should grow alfalfa, and should make it a part of our crop rotations. It should be grown wherever farm, dairy or beef animals are kept. A ton of alfalfa is worth as much for feeding purposes as a ton of wheat bran.

But while we recognize the value of the crop, and admit the desirability of growing it, we cannot but admit also that there are certain difficulties to overcome in the growing of alfalfa that cause many people to fail and to become discouraged. I think though that people who have had some experience in alfalfa growing consider the difficulties not at all impossible to overcome. That is, when the demands of the crop and of the soil are recognized, the growing of alfalfa is no more difficult than the growing of clover.

We learn, as we begin to grow alfalfa, that while there are soil types better adapted to this crop than other soil types, we also learn that practically every type of soil will grow alfalfa provided certain conditions are met. Whatever the soil type may be, it must of all things be well aerated. A soil compact enough to prevent the proper circulation of air is not well suited for the growing of alfalfa. We must have a soil that is deep and one that is well aerated. We must have a soil that is not acid. We learn a great deal about lime when we come to study alfalfa growing.

Crops differ in their lime requirements. There are those that will grow by preference on sour soil, and there are even legumes that will prefer a sour soil. We have a wide range, in other words, in the needs of different crops for lime, but of alfalfa it may be said safely that there is hardly any other crop that will make as great a demand on the soil for lime. Therefore for the growing of alfalfa successfully we must provide not only a well drained soil, but one abundantly supplied with lime.

Some years ago we were carrying on experiments in southern New Jersey on a very light, sandy soil, whose owner had previously

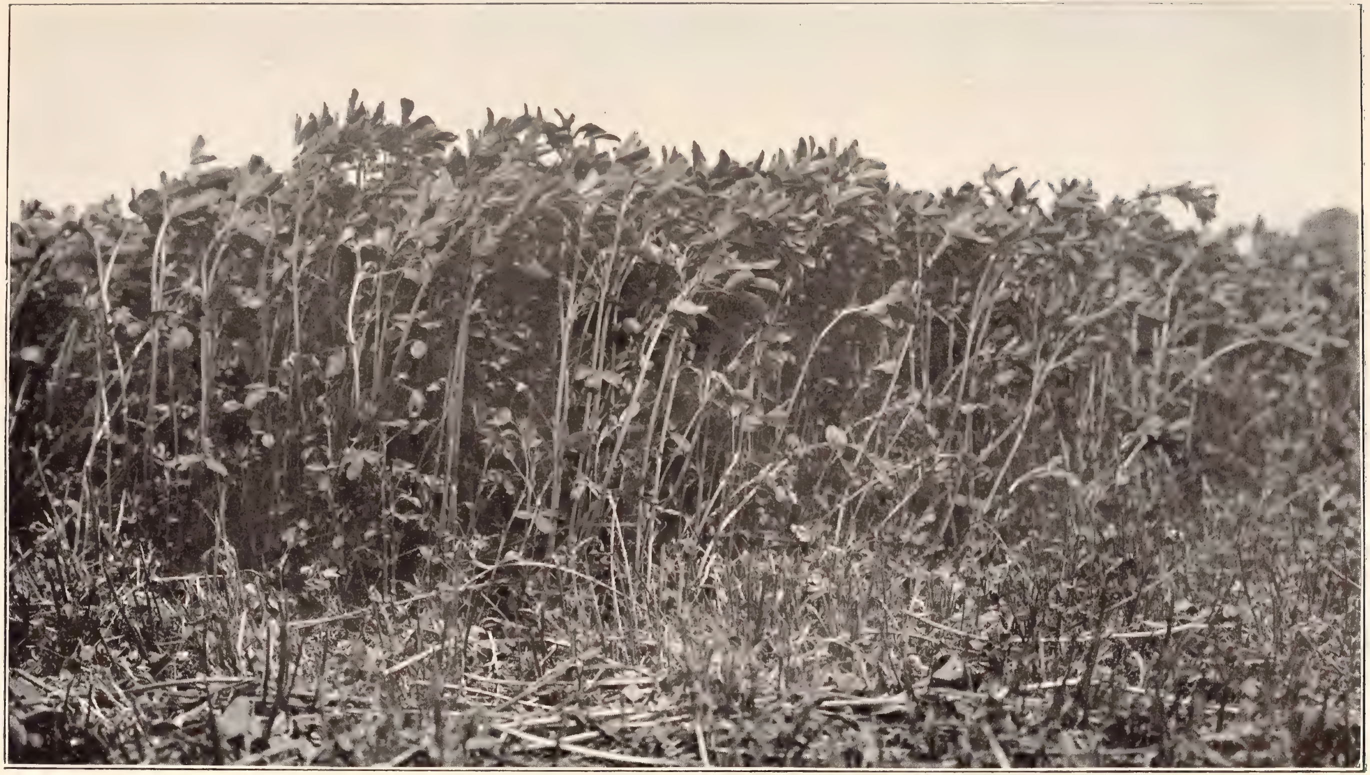


Fig. 3. A Field of Alfalfa.

seeded one of the fields with alfalfa. When we started with our work there that field was, I think, probably seven or eight years old, alfalfa had disappeared but for a few isolated plants here and there, with the exception of one corner where it still was very good. I asked the owner if he could explain why that particular corner of the field still had a fine set of alfalfa. He said: "I have no explanation to offer except possibly this: Just prior to the seeding of alfalfa we limed our land at the rate of one or one and one-half tons per acre. We had a load or two left over and I told the boys to dump it in one corner. Probably that may explain why that alfalfa is growing so vigorously."

I want to emphasize the importance of using enough lime not only to secure a successful stand, but also enough to keep the plants in full vigor.

There is a field of alfalfa in California that is fifty years old and the plants are still there. We also know that alfalfa grows almost naturally in the irrigated sections of the United States. When we stop to examine the character of these soils we will find they are all rich in lime.

In our own State, New Jersey, the people who have grown alfalfa without any particular effort are mostly located on limestone soil. The lime permits the alfalfa to hold its own against other crops, weeds, and particularly grasses. Unless the environment is agreeable to alfalfa it will be crowded out. Too much cannot be said, therefore, of the importance of adding an abundant supply of lime to the soil, not only to secure the growth at the beginning but to maintain it for some years.

Now, in the course of years, there has come to be an adjustment between the plants and the bacteria. We do not understand this adjustment, but we know that clover and alfalfa are not normal plants when not inoculated. They are abnormal plants and in order to become normal plants they must have nodules on the roots. I do not mean to say that we cannot grow alfalfa without bacteria. In fact alfalfa plants are grown in old gardens without any sign of nodules. Thus we have plants which derive their nitrogen from the soil rather than from the air, making the soil poorer rather than richer. When we study successful alfalfa production we recognize the three important attributes—proper soil drainage, the presence of lime and of inoculation. The third is as important as any and is as likely to be absent as any. We must therefore provide for the inoculation of the soil.

To begin with, the successive steps in the process, as it is followed by most successful alfalfa growers, what are the important stages in the growing of alfalfa? In the first place, the alfalfa grower will provide for a clean seed bed. In other words, in the competition with weeds or grasses the young alfalfa plants are more likely to win out in the struggle when a clean seed bed is provided. Therefore alfalfa is seldom grown after timothy or sod of any sort, but preferably after the land has been covered by some cultivated crop. The rotation may be corn, oats and peas or potatoes and alfalfa. But whatever the rotation, successful alfalfa growers will provide for a clean seed bed.

In the next place the alfalfa grower will supply a generous amount of lime. You will at once ask how much lime should be used and what kind of lime should be used. These questions are often raised by men who are confronted with them. The amount of lime will vary with the soil. The heavier, the more; the lighter, the less lime. But for light, sandy soils we should need at least a ton of lime to the acre, on the basis of burned lime. I have seen splendid alfalfa grown with not more than a ton to the acre. On soils that are not lime-stone soils it would be safer to apply possibly one and one-half tons. Heavy clay soils that have not been limed for several years should have fifty bushels to the acre. Some of it applied before plowing and some after plowing would give the best results. As to the form of lime, that is whether it be ground limestone, or slaked lime it is immaterial, provided enough be used, except that for very heavy clay soils, I should prefer to use slaked lime. For medium soils it does not make a great deal of difference. One ton of freshly burned lime, properly slaked, will go practically twice as far as one ton of ground limestone.

As to chemical composition, magnesian lime is, for practical purposes, as good as non-magnesian lime. It will give just as good results, except on light sandy soils.

Having applied the lime the alfalfa grower is confronted with the next question as to the plant food to use. Should he use stable manure, or commercial fertilizer, or both; and how much is he to use? In our earlier experiments we used barnyard manure. We secured beneficial results wherever barnyard manure was used, but we also found that the growth of grass and other plants was stimulated and the crowding out of the alfalfa proceeded in a more rapid way. In our work now we prefer not to use any manure at all except for the preceding crop. We find that a direct application of barnyard manure is not desirable. We now depend entirely on commercial fertilizer. We used to employ a mixture composed of equal parts of bone meal, acid phosphate, and muriate of potash. Because of the increased cost of bone meal we find that it is very much cheaper to use a mixture of acid phosphate and muriate of potash. You will find that for almost every soil this mixture is cheaper and quite as effective. It consists of 300 pounds of acid phosphate and 100 pounds muriate, applied at the rate of 400 pounds per acre. In the case of light, sandy soil it would be better to use 150 pounds instead of 100 pounds muriate. We make practically the same application every year. The material is not costly. Acid phosphate may be bought for $12.00 or $13.00 per ton and muriate for about $40.00 or $41.00 per ton.

The fertilizer cost for the alfalfa crop, considering the benefits derived, is therefore a minor matter. The crop gets its nitrogen from the air and we do not need to supply it. I might say, though,

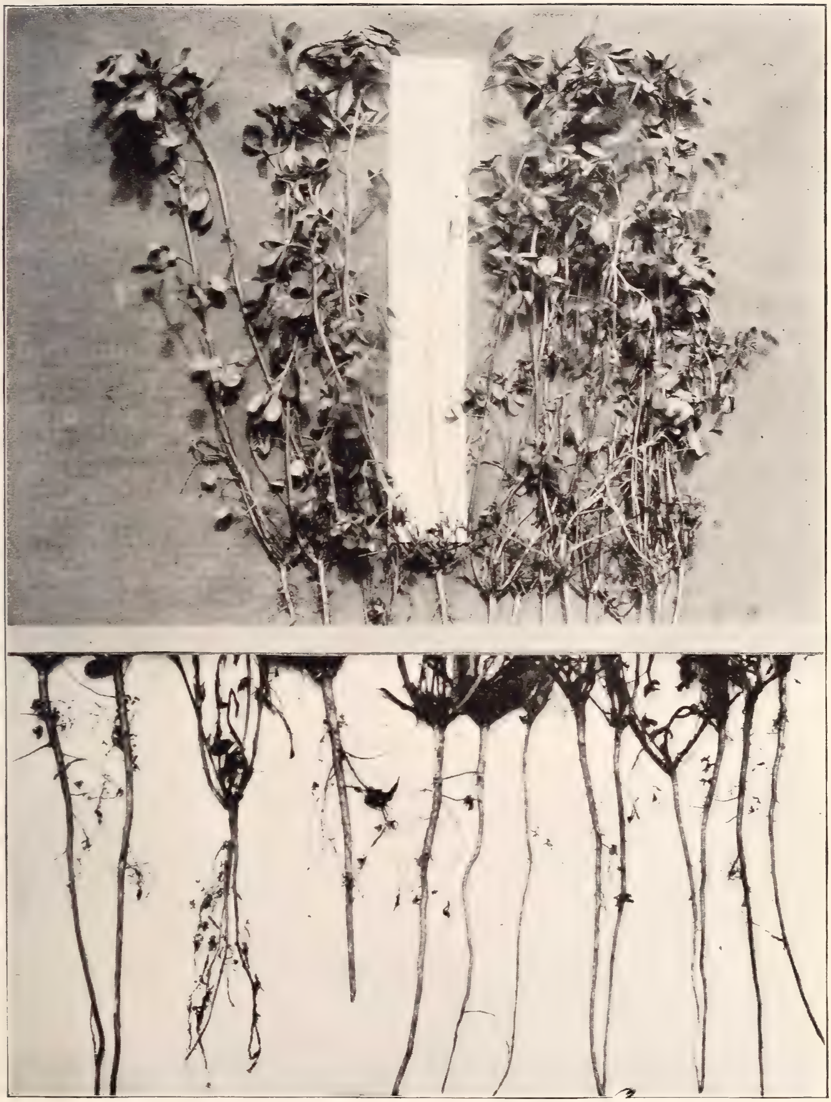


Fig. 2. Alfalfa Plants Showing Nodules on Their Roots.

in this connection, that some of our agricultural papers recommend the use of nitrate of soda at the time of seeding. The reason given for this is that the young plants do not develop the ability to get nitrogen out of the air at once. To tide them over the period of scarcity it might be well to use nitrate of soda. In my own opinion this is not necessary except where the soil is very poor, but after all it is not advisable to attempt the growing of alfalfa on the poorest land. It is better to improve it with fertilizers and manure, for alfalfa does not do well on land that lacks fertility.

The next step that we have to consider after we have applied the lime and fertilizer is the question of inoculation. We must decide how to introduce those bacteria that are to form a partnership with the plants, and developing on their roots, will enable them to draw nitrogen from the atmosphere. The farmer has at his disposal several methods of inoculating the soil or "vaccinating" the soil, as some one has put it. He might take soil from a field where alfalfa has grown, or he might use what is called an artificial culture of bacteria. Such cultures may be secured free of charge from the Department of Agriculture at Washington. The process of preparing cultures is rather simple. The bacteriologist will go out into a field and will dig up a quantity of plants. He will wash off the roots in clean water, break off one of those little nodules, which contains many thousands of bacteria, and will immerse it into a solution of corrosive sublimate or strong alcohol, to kill the bacteria adhering to the outside of the nodule. He will then cut that little nodule open, and with a sterile needle will transfer some of the contents into a solution made up of several salts that can be bought at any drug store. This solution is for the bacteria a culture medium, just as flour and water make a culture medium for yeast in bread making. In any favorable culture medium the bacteria multiply very rapidly. Some of the commercial cultures, instead of coming in liquid form, are sold as a jelly similar to that bought for making pudding.

I cannot emphasize too much the importance of inoculation, as well as of liming and of proper preparation of the seed bed.

Something should be said about the seed. Failures in alfalfa growing occur in spite of proper liming, inoculation and fertilization, and these failures are almost always attributable to poor seed. The Colorado Experiment Station has been carrying on some very interesting experiments for the last two years on alfalfa seed from different sources.

A great deal of the seed that comes from southern Europe is not hardy enough for our climate. Unfortunately, however, many of us do not inform ourselves as to the source of the seed. We should make certain that it is derived from a proper source. So many of us fail to make proper inquiries concerning the origin of the seed, and for this reason fail in the growing of alfalfa.

If time would permit I should like to discuss the second part of alfalfa production, the handling and curing of the hay, but I have taken up a considerable amount of time, and if your president thinks it is in order to continue the discussion I shall be glad to do so.

Mr. Tenny. In a field where potatoes were grown last summer when would you seed to alfalfa?

Dr. Lipman. We find that between the 15th and the 25th of August is the best time for us under all conditions. We have tried spring seedings and have had success, but on the whole we find the best time in August because we can get our seed bed ready, particularly as the growth of weeds is sufficiently retarded by that time. In Wisconsin they get the best results by seeding in the spring. They use 20 pounds of alfalfa seed and about 50 or 60 pounds of barley per acre for spring seeding. The climate will determine the best time to seed. If you go far enough south I dare say you will find spring seeding most satisfactory. In Adams County, I am quite certain that from the 10th to the 15th of August would be the best time. I might add here that in Ohio they have been experimenting in various ways. For instance, they have used alfalfa as a catch crop, now and then, with good success. Then they have used alfalfa as we use clover for seeding with oats. There are various ways in which it may be used, and now and then one man will succeed where others fail, but as a general method for southern Pennsylvania or New Jersey and almost all of New York, seeding in August, on the whole, will give the best results. Prof. Hopkins, of the Illinois Station, has made the claim that the bacteria will form nodules on the roots of sweet clover, and will also form nodules on the roots of alfalfa.

R. A. Wickersham. Could you grow sweet clover as successfully and profitably as alfalfa?

Dr. Lipman. I do not think so. I think that sweet clover will not compare favorably with alfalfa for yield, but at the same time sweet clover has its uses and will grow on soil too heavy or too wet for alfalfa. Where alfalfa can be grown successfully, all people who have compared the crops will admit that it is a better crop than sweet clover.

A. W. Griest. For alfalfa started this fall, what would you recommend as a fertilizer, after the first cutting next summer?

Dr. Lipman. I would recommend 300 pounds of acid phosphate and 100 pounds of muriate of potash. No nitrogen. The crop is able to get its nitrogen from the air.

Question. How would you apply that fertilizer?

Dr. Lipman. You would want to broadcast your fertilizer. We have taken the matter up in New Jersey now as to keeping alfalfa in for a longer time—possibly about 20 years. If we could keep alfalfa in for 12 or 14 years it might be cheaper to put it in rows rather than broad cast it. We intend to find out whether it would pay to have alfalfa sown in rows.

LESSONS FROM WESTERN APPLE GROWERS.

Mr. C. E. Bassett.

The average farmer is not a good business man. That is a harsh statement, but we may as well face it and make the most of it. If we ever take a look at our competitors it is to become jealous of their successes or to gloat over their failures, rather than to study their methods so as to adopt what brings success or avoid the plans which lead to defeat.

It is reported that within two years the Pacific Coast will have over 15,000,000 bearing apple trees. That is interesting to the eastern grower, because he ought to plan his work so as to meet that competition. My home town of Fennville, in western Michigan, is known to very few of my hearers—is hardly on the map, so far as you are concerned—and still it ships more apples to cold storage every year than does the world-wide known Hood River Valley. Western New York and southern Pennsylvania also have points that excel Hood River in the quantity of apples grown and shipped, but it is in the quantity and natural quality that we lead, while it is the finish and excellence of pack that has put the Pacific Coast points on the map in big red letters.

We all have a general knowledge of western conditions, but it was this summer, while visiting that section, that I had an opportunity to study their problems by seeing for myself and by talking with the growers. The western land agents know just how to use the brightest tints of printer's ink when describing their wonderful land bargains and their use of superlatives is sufficient to put the advance agent of the modern circus completely in the background.

Among the many horticultural leaders that I met and conversed with was the head of one of the large fruit exchanges, who seemed to take as much interest in eastern fruit progress as in what was being done in his own section. He was keeping a sharp eye on what their competitors were trying to do and on the probable effect it would have on their business. As I told him of the reviving of interest in horticulture in the east, the rejuvenating of old apple orchards, etc., I said, "What are you going to do with these high-priced orchards when we get our methods improved and our organizations for fine packing completed in the east?" What do you suppose his answer was? "You never will do it!" He practically told me and, through me, he tells you that the Pacific Coast grower relies on the lack of business of the eastern grower—upon his laziness, his shiftlessness, his dishonesty, if you please. Was he right? I put it up to you. Did he tell the truth or is it a libel upon the manhood and womanhood of our eastern growers? Your answer must come in the work that you do in the future. Acts speak louder than words and if we continue to practice the slack methods of the past, that man told the truth and we will deserve our fate. But I don't believe him. I have faith in the latent honesty and business ability of our eastern growers.

The western growers went there mostly from the east and crossing the Rocky Mountains did not especially work a miraculous change in their honesty or business ability. But their disadvantage of high-priced lands and their distance from market have worked out to their advantage. My home town is only a few hours from Chicago—the largest distributing market in this country—and, since we can ship anything to Chicago and get something for it, most of us are raising anything, shipping everything and are getting a little of nothing, and then, to cap the climax, are trying to lay the blame on everyone except the right party—ourselves.

Next to the disadvantage of distance from market, the other disadvantage that works out to their advantage is the inflated price of land. This compels the western grower to practice intensive cultivation, as compared with our extensive methods. An Illinois farmer sold his 110 acre farm and invested the entire price in 10 acres of apple and pear orchard in Oregon, and on that orchard he was hiring as much help and using almost as many horses as he formerly used on his big farm in Illinois. Think of it! No wonder that he produced the very finest fruit that sold at the highest price. If you and I would let about three-fourths of our land lie in grass or simply rest and then on the balance of the land devote all of our usual energy and brains, we might not produce quite as many bushels of fruit as before, but we would have nearly as much of a much higher quality and our profits, reputation and happiness would be increased many fold.

When you stop to think that the price the western grower pays for transportation alone to my home market would be a big profit for me in my business and that I do not get it, simply proves that the statement with which I started—that I am not a good business man. I wish that I could drive home to you the insult, if you have any manhood in you, that that man gave to us when he said we would not do these things. He did not say we couldn't; he did not say that we lacked natural advantages, but he said we lacked nerve; that we lacked the western spirit of "get up and get." That statement rankles in my breast and it ought to in yours. God gave Michigan, Pennsylvania, New York and all this grand country wonderful opportunities and if we fail, no one is to share the blame with us.

The western apple excels in what I call "finish" and in addition to freedom from insect and fungus injuries, that finish is largely due to high color. Just as long as attractiveness to the eye is the first standard by which the buyer selects his purchases, richness of color will be an essential. While our best fruit authorities may disagree as to the possibilities of increasing color in fruit by the application of potash, phosphoric acid or other chemicals, no one can deny that the one great cause for color is sunshine—God's great gift to man. While the west may have a little more of sunshine, on account of their dry atmosphere, do we not have sunshine here in the east? The chief point of difference lies in the fact that the method of growing trees in the west is such as to make the greatest possible use of that sunshine, while we in the east are so anxious to get an immense amount of bearing wood on our trees and also crowd our trees so that they interlace, thus making our orchards appear more like a forestry proposition. Their trees are low and with open heads—vase form. In our greed we leave so much brush in our trees that a sparrow can hardly fly through them. We overwork our trees and then starve them. They restrict their trees by severe pruning and thinning of the fruit so that the trees can do their best and keep it up. In trying to discourage us the western land agent says we could not have their kind of open heads, that "The sun scald would kill your trees." Don't you believe it. The only disease we need fear in the east is "dry rot" and the most violent form of this disease is where it attacks the *man* rather than the tree.

While we must be more thorough in our spraying, we must practice more intelligent pruning and thinning of fruit if we want the high grade that is skimming the cream from our own markets. I know that some of my eastern horticultural friends are issuing words of caution for fear that we will prune too much, and thus "upset the balance" or do something equally unwise. Did you ever stop to consider that our "forestry" methods have been standing us on our heads so long that we have lost all thought of any "balance"? What, pray, will restore the "balance" to a starved root system, but to restrict by pruning the heavily loaded top? An overloaded and starved team are first relieved by removing a part of the load. Where you find one grower who has made the improbable mistake of pruning his orchard too much, I can show you thousands of growers in leading fruit sections who do not prune enough and hundreds of others who do not prune at all.

When the western grower sees an imperfect apple on his tree in the growing time, he realizes that that fruit can never grow to be anything but a cull and it is at once taken off to make room for other fruits. They thus grade their fruit on the trees, because they know that it takes as much of the vitality of the tree to ripen a cull as it does to put the finish on a perfect fruit. In the east the practice is to leave all the fruits that set until harvest time, then paw them over on the packing table to find enough fairly good specimens to face out the barrel. What happens after that we blush to relate. You say it costs money to thin apples. Does it cost any more, or even as much, to pick off the extra fruits and break up the clusters in June, dropping the little culls on the ground, than to wait until harvest time and then pick the whole mess (and, by the way, that is a very good word) carry them down the ladders, pour out on the packing table, sort them and put the culls in the cider lot or in a more improper place?

Not only do we fail to grow as good fruit as we might, but we have had no system of grading and packing. Why are people not eating and cooking more apples? Have they lost their taste for apples? Why is the demand for bananas, oranges, grape fruit and western apples increasing while our own superior quality apples go begging a market? You know the reason. The man who buys a barrel of our apples buys them under a suspicion and pays a price accordingly. All business is and must be based on one principle—confidence. The average eastern pack of fruit does not command the respect of the consumer and the man who starts out to pack honestly and then market in the old way generally finds himself in bad company and too often suffers as did "old dog Tray."

But the Sulzer bill, which takes effect next July, offers us a means of establishing a reputation and of being known as packing an honest grade, for which the consumer will eventually call and pay a good price. Let us adopt this new law and then by modern systems of distribution, through co-operative organizations, modeled after the western methods, we will enjoy increasing demands from a satisfied purchasing public, our markets will be steady, prices will be good and we will not only possess the cash and confidence and respect of our customers but we will have that self respect that comes from a feeling of work well done.

Fennville, Michigan.

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PRINCIPLES OF COOKERY AS APPLIED TO FARM COOKING.

MRS. EDITH C. SALISBURY.

Mr. President, Ladies and Gentlemen: I do not feel that I am coming to an audience of strangers although I came a long way, because when I see a lot of people together I know that they have very much the same feeling toward my subject in all parts of the world; they like to eat and are interested in good cooking.

You have been studying this problem of cooking, perhaps, but have you ever stopped to consider how you can make money in cooking? Possibly I cannot tell you how you can make money in actual dollars and cents, but how you can *save* dollars and cents. I want to show you where you can make some changes and save some money. We have been told many times by people who have been making a special study of the subject, that half the cost of living is the cost of food. The increased cost of living partly comes from the amount we are spending on food. Is it necessary? Let us see for a few minutes. Suppose we think of the human body as a machine. It is very much the same in several particulars as an engine. The engine is made of certain materials that require food, which is fuel; that food will compare with human food. The body is different in this respect, that the fuel does not alone give the body its power to do work that is required of it, but also must build up that body and must supply heat, so we need the fuel of the body to do more than the fuel of the engine. We must have, then, food that will accomplish three things—build and repair tissue, give heat, and give energy.

Every person should understand food values. I have seen men at hotels who would take the bill of fare, look it over, and pick out the things they like, perhaps. Very few men care to select for themselves. They will start off with soup, then some meat, or they may take a couple of kinds of meat, then baked beans; then begin on vegetables, some macaroni, potatoes—perhaps white potatoes and sweet potatoes. Then they will go on down the list and order half the things there. When they get to the desserts, they take three or four of those. I have counted as many as thirty-five little dishes around one man's plate; not more than half the contents eaten. It was not what he ate but what he wasted that cost so much. Do you wonder why living is high?

If the man had known just exactly what he should have eaten for the good of his health, and how to keep the human machine in the right kind of repair, he would have selected a little more wisely. He would have taken something for energy and heat, also he would have taken two other classes of food that are very necessary to health—some mineral matter and some water that would make the food soluble and assist in carrying it to the tissues.

We have five classes of foods. One class builds tissues, and is represented in nine kinds of food—lean meat, fish, white of egg, curd in milk, cheese, gluten in bread, legumin in peas and beans, and nuts. This is the only kind of food that will build tissue. It is the class of food that supplies nitrogen. You farmers like to feed alfalfa to your stock, because it too contains nitrogen, but you don't care to give all the nitrogenous food at one time, so why should you take fish and all the kinds of meat you can mention, and eggs, all at the same meal?

I have seen all of these nine tissue-building foods in one meal. Even though so many foods may not harm your digestive organs, it takes too much time to prepare them. There are three things we all want to do, to save time, save energy, and save money. Now the meal which has all those nine tissue-building things costs too much.

We want some foods that will give heat, and this we get from fatty foods. This class of food consists of butter, cream, the fat of all meats, olive oil and other oils which we use in cooking; these are known as the heat producing foods.

Then for energy producing foods, those that give us power to move our arms and do anything we wish, we have another class that includes sugar and starch. Most people who are fat are fond of starches and sugars.

Some one has said that one big difference between man and other animals is that man likes his food cooked. We like all kinds of animal food cooked, as they are more palatable, but by cooking we harden the albumen which we find in all animal foods, and this makes it a little more difficult to digest.

Cooking is something that we do more or less of three times a day, and if a woman is successful she is rather interested in it. We have heard about luck in cooking; there is no such thing as luck in this particular line of work. If a cake is not a success there is some good reason why it failed. There is no more luck in cooking than there is in a druggist mixing up a prescription. If you went to a drug store to get a prescription filled, and after waiting a while, the druggist gave it to you with the apology that he had had bad luck with it, you would not think very much of that chemist. It is just the same with cooking. Certain rules must be followed. I must know how to combine ingredients; I must have a certain temperature, then I will always get the same results. If you are not a successful cook, do not think that Fortune has not smiled on you as kindly as she has on some one else, but there is some mistake in your method, or you are not interested in it sufficiently to give it care.

The more you are in the open air, the more you are going to eat, just the same as the more air you give a stove, the more fuel it will use. A certain manufacturer was confronted with the subject of ventilation in his factory. He put in a better system of ventilation and the women and girls came to him in a very short time and said, "You will have to take away this fresh air and ventilation, because we cannot afford to eat as much as we are eating now." He, being a wise man, said, "I will increase your wages." Invariably you will find that people who are out in the open air will require more to eat than those who work in closed rooms, and that is why a farmer requires more to eat than a man in a store or office.

If I should tell you that with some bread and butter, a glass of milk and some of these apples, you would have just as much nourishment as your body can take care of, would you believe it? You would stand just as good a chance of being well developed as if you sat down to as big a fare as could be suggested. You say you would not be satisfied with it. Why? Not because your hunger required more, but because you have developed an abnormal appetite. Americans have this appetite more than other people, but we are not any healthier than some of the other nationalities. We do not show up any better when it comes to times of great muscular effort. The excess food does not do us any particular good, probably some harm, for lots of people about middle age have some form of stomach and liver troubles, which is generally due to mistakes in diet. The simple fare is quite as nourishing as the more elaborate. You will get all the body requires, all the tissue-building material and all the heat and energy necessary from a piece of cheese, bread and butter, —and a cup of tea, if you wish. I would add to it some celery or some other kind of vegetable, or some apple sauce, if you wish; we get most of the mineral matter from the vegetables and fruits. The simpler the bill of fare the better it is for your health and your pocketbook.

As to the principles of cooking; it is well to spend more time making things better, if you can, than to try to make so many things at once. You cannot bake pies and cakes and roast beef in the oven at the same time, and have them all equally satisfactory. I would far rather sit down to a table with nothing on it but mashed potatoes and roast beef, if they are correctly prepared, than a long bill of fare badly cooked. Speaking of mashed potatoes, I do not know of anything that is more likely to cause dissension in a family than a watery potato served instead of that feathery, light, fluffy, dish of potatoes that is like a snowdrift. There is nothing more delicious or more digestible than baked potato. If it is left in the oven too long it is heavy, soggy, and tough-skinned and not half what it should be.

There is no better way to prepare beefsteak than to broil it. There are some men who can cook a steak better than women. I have always found that when a man can cook he usually does it well, because he takes pride in it. He knows where the best steak comes from and he is particular about rules and directions. He wants a good, hot fire, glowing coals, and a broiler or a frying pan just as hot as he can get it. He cooks the steak on the outside quickly, to keep the juices in. He knows that if the juices are not in the meat when he cuts it, it is not a success.

A man often makes a better cup of coffee than some women, because he makes only one thing at a time and gives all his attention to it. He has freshly boiled water and measures out his coffee carefully. Many women will not measure, they use a "pinch" here and a "little" there. The high priced chefs and cooks are not women, but men. A man makes coffee stronger sometimes than a woman, because he knows that it is not a good thing to cook coffee a long time in order to draw out all the *good,* as the bad comes out at the same time.

Question. Will you tell us how to make good coffee?

Mrs. Salisbury. Take two level tablespoons of coffee to each cup of coffee to be made. If eggs are not too high, use an egg and the broken shell to six or eight cups. The white of the egg settles the coffee and the yolk makes it richer and improves the color. If you have good cream it will be good enough without the egg. Mix the coffee, egg and water and put over the fire, when it comes to the boiling point let it simmer for two or three minutes on the back of the range. The cover of the coffee pot should be tight to keep in the aroma.

There is a right and a wrong way to boil eggs. There is a right and a wrong way to boil water. For drinking, hot water should be used when it is bubbling; freshly boiled is the only kind that is used to make tea. Do not allow the water on the tea to stand more than four or five minutes or too much tannin will be extracted.

Always women are going to have more or less to do of the home affairs. If they are not going to do the actual work themselves they will have to manage it. Do not let a girl grow up and marry and go into a home of her own unless she has a knowledge of home making. It is a business worth studying and when you study it you will find that there is a good deal in it. Don't think just because you are keeping house you are doing nothing worth while. You are engaged in one of the greatest works. Home-making is a subject every woman should know because it is woman's work. Don't think that the girls should be denied the knowledge because you had a hard time learning to cook, but insist that they understand the science of it.

I read a story about a boy whose only work in a factory was to make bolts. All day long he had nothing to do but run a piece of metal up to a certain machine and hold it there until the bolt was made. It got monotonous, but instead of giving it up the boy decided to get something more out of it if possible. He began by trying to eliminate energy and to make more bolts with a decrease of effort. In a few years he was an expert in eliminating work in foundries. The same thing will apply in cooking. You cook potatoes every day; try to see if there is some other way to do it, to save energy and get better results. Save time for yourself and study new methods and you will find new interest.

Questions and Answers.

Can you tell us how the man makes good coffee?

Mrs. Salisbury. He knows the number of cups of coffee he is to make and he allows two level tablespoons of coffee for each cup. If cream is scarce, or if he likes the beverage especially rich, he mixes the ground coffee with part of an egg, using the crushed shell (he washes it first) as well. Then he adds one cup of cold water and mixes egg and coffee well together, then adds the remainder of the water, measuring it exactly, puts the coffee pot over the fire and lets it come to a boil slowly. He stirs it occasionally to allow the water to thoroughly penetrate through the coffee. After boiling just one minute he sets the coffee back on the range where it will simmer, and not boil, for three or four minutes. Boiling extracts too much tannin from the coffee and that is the objectionable property. The coffee pot must be tightly covered to prevent the escape of the volatile oils which give it its fragrant aroma. The white of the egg settles the coffee and the yolk gives it is better color and richer flavor. If cream is scarce, serve the coffee with scalded milk, instead of cold, and you will have a better beverage.

Question. How do you like the coffee percolator?

Mrs. Salisbury. I think the percolator makes ideal coffee. Both coffee and water are used in the right proportion; the coffee is placed in the upper part of the percolator, the boiling water is below. The steam rises, passes through the coffee ground, condenses on a little metal disk at the top then goes back through the coffee taking the extract with it. The water does not stand on the coffee grounds and there is less chance of extracting the tannin by this process of making. Some people make excellent coffee without boiling while others do not consider the flavor quite as finished if it has not, at least, been brought to the boiling point. Either method is correct so long as the boiling is not continued for any length of time and if the coffee is not allowed to stand on the grounds.

Question. What is the right way to broil a steak?

Mrs. Salisbury. You should have the steak cut at least one inch thick and have either a glowing bed of hot coals or a "sissing" hot frying pan. Do not use any more fat in the pan than just sufficient to prevent sticking; wipe the steak with a damp cloth, do not put it in water to wash as this extracts the juice. Put the steak in the hot pan, or on the broiler, and it will sear immediately, that is, the albumen on the surface of the meat will be hardened. Turn over the steak and sear on the other side. If you are using a broiler, turn it from side to side until the meat is well seared; if you are broiling in a pan turn the meat several times during the first two or three minutes but turn it with a knife instead of a fork, as piercing with a fork causes the juices to flow. When the meat is well seared on both sides cook at a lower temperature until it is done to suit you—about 12 minutes for rare and 15 to 18 minutes for well done. Do not add the salt until the steak is almost done and when it has been removed to a hot platter dot it over with small bits of butter, this improves the flavor. Steak should always be cooked until it is pink, not dark red, in the center. A dark red streak through the middle shows that the temperature was not sufficiently high—160 degrees Fahr.—to kill germs if any had been present. If the steak has been properly cooked there should be very little if any juice in the pan. Do not cover the pan if you are broiling; this method of cooking meat is suitable only for the tenderest portions, such as tenderloin and porterhouse; steaks cut from the round and some parts of the sirloin are better if they are not cooked so rapidly.

Question. What is the best way to cook these apples?

Mrs. Salisbury. Apples are delicious cooked in any way, but I think the simplest is the best way, using very little sugar or spice in the cooking in order to preserve just as much of the natural apple flavor as possible. A baked apple, that is one baked without sugar and without spice, is about the best way of all and apple sauce is a close second; then I think there are few things more pleasing to the palate than a pie well filled with tart, good-flavored apples.

Question. What do you think of the fireless cooker?

Mrs. Salisbury. I think it is one of the best aids we have in cooking; it saves fuel and time and generally results in better cooking. Of course if you are burning coal or wood and have a fire in the range all the time the saving of fuel is not so important as it is when gas or kerosene is the fuel and when the oven must be heated specially every time it is used. But even then there is the matter of saving time and that is important. When you have put anything to cook in the fireless it requires no more attention until it is finished and if you had the temperature sufficiently high to start with there is no question but that it will be deliciously cooked—tender and juicy and all the flavor retained.

Cold Storage is the best way of keeping fruit—everybody knows that. **The Madison Cooper Brine System,** using ice and salt for cooling, gives the best results, and those who are using this system know that, too.

WRITE US FOR DESCRIPTIVE MATTER ESTIMATES AND SUGGESTIONS

MADISON COOPER COMPANY

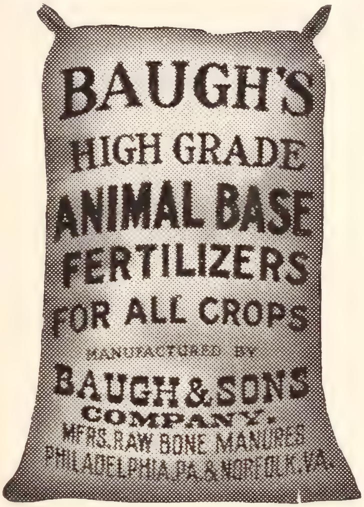
Refrigerating Engineers and Architects. **123 Court Street, Calcium, N. Y.**

FARMERS MAKE MONEY

by the liberal use of

BAUGH'S COMPLETE ANIMAL BASE FERTILIZERS

for Fruits and all other Crops



BAUGH'S RAW BONE MANURES were first manufactured in a small way more than fifty years ago. All along the intervening years the control of these Oldest in America of all makes of Animal Bone Fertilizers has never passed out of the hands of the Original Manufacturers.

BAUGH & SONS COMPANY

OF BALTIMORE CITY

MANUFACTURERS AND IMPORTERS

FOR SALE BY

ASPERS MILLING & PRODUCE CO.
ASPERS, PA.

G. W. KOSER
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NEW OXFORD, PA.

GROVER C. MYERS
IDAVILLE, PA.

Baugh's 1913 Almanac just out. Ask your dealer for it or write us.

Ford
THE UNIVERSAL CAR

¶ THEY are coming 200,000 strong for 1913, a car for every purpose.

¶ The only light, strong car made of all vanadium steel, the strongest metal known, will stand 134 tons to the square inch. Vanadium does to steel what grains running lengthwise does for wood. Every part carries the strongest guarantee. Can be operated for less expense per mile than any car known.

5-Passenger Touring Car - -	***$600***
2-Passenger Roadster - - -	***$525***
Town Car - - - - - -	***$800***
Delivery Car, 1000 lbs. capacity -	***$650***

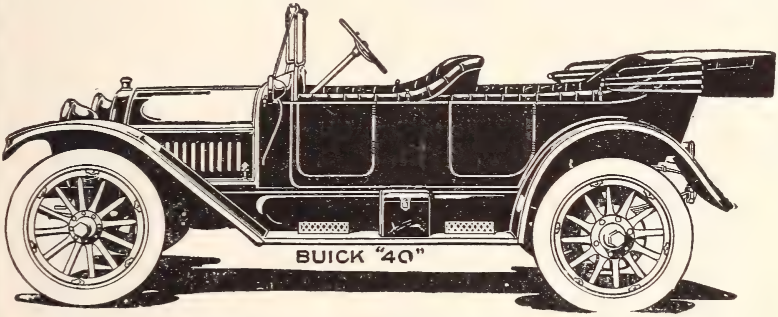
F. O. B. Detroit, Mich. $25 freight on each.

GET IN TOUCH WITH

J. W. Richley Auto Co.

DISTRIBUTORS

237 E. Philadelphia St., :-: York, Pa.



Price $1650, Fully Equipped

BUICK

Stands for power, durability and long wearing qualities, also the most beautiful design and finish for 1913. Any Buick Car will last a lifetime if used as a car should be used. No other competitor can give you more real automobile value for a dollar. The overhead value Buick motor will produce 30 per cent. more power on 20 per cent. less gasoline than any other motor on earth. Any man can clean a Buick motor and grind all valves in two hours without disturbing a single vital part, that is what has made the *Buick Motor Co.* the largest automobile factory in the world. Five Passenger Touring Cars ***$1050, $1285*** and ***$1650.*** Two Passenger Roadsters ***$950*** and ***$1125. F. O. B., Flint, Mich.***

GET A FREE DEMONSTRATION

J. W. Richley Auto Co.

237 E. Phila., St. ***YORK, PA.***

AT THE EVAPORATOR.
A Good Place for the Culls.

THE

Citizen's Trust Company

OF GETTYSBURG

President,	Vice Pres.,	Treasurer,
GEO. W. SWARTZ	W. T. ZEIGLER	H. L. SNYDER

Your Bank Account and Trust Business Solicited

¶ We pay 3½% on CERTIFICATE if left 60 days or more. We act as Guardian, Trustee, Administrator or Executor, in settling up estates.

¶ Courteous treatment and prompt attention to business a feature.

R. WM. BREAM, Secretary.

Established 1887 *100 Acres*

Kelly Bros. Fruit Trees

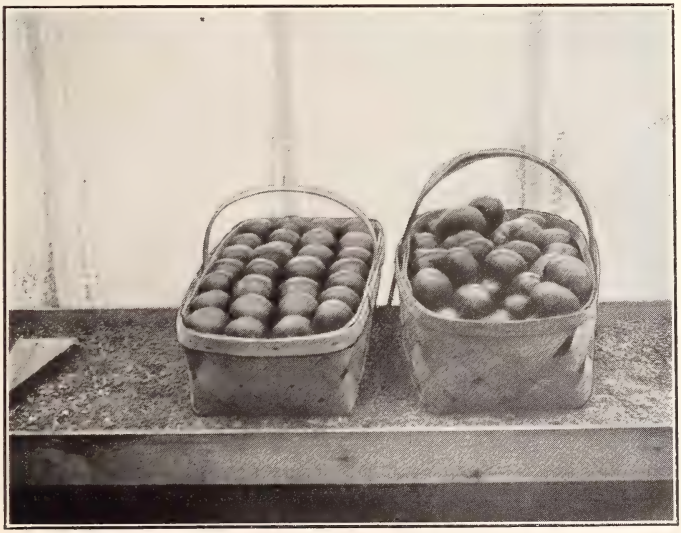
Direct from the Nursery to the Planter

WE grow our own trees and can guarantee them true to name, which we believe is the most essential part of the fruit tree business. We are located in the famous Genesee Valley, the best locality in the world for growing healthy fruit trees. Mr. Barton, the N. Y. state inspector unreservedly says that he has never found San Jose Scale in the nurseries at Danville.

Write us to-day for Illustrated Catalogue

KELLY BROTHERS

20 Main Street :-: *DANSVILLE, N. Y.*



Neat Facing is Not Dishonest Packing.
Both Alike to the Bottom.

The

Gettysburg National Bank

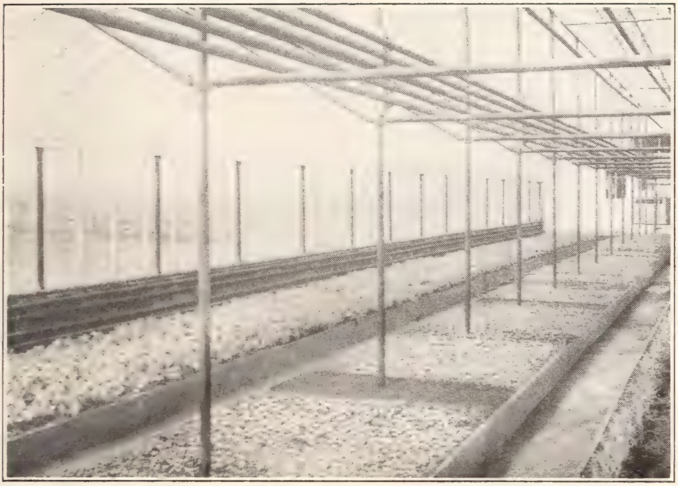
Capital, $145,150
Deposits, $930,000

Pays 3½ per cent. on Special Deposits

¶ We offer the public the use of our large fire-proof and burglar-proof safe deposit vaults FREE.

WM. McSHERRY, President E. M. BENDER, Cashier

State College Students at Work Gathering Tomatoes.



One of the Greenhouses at State College, Showing the Student Plots.

No. 1, **FOLDING CRATE,** with or without cover.
See catalog for other styles and sizes.
OVER 15,000,000 IN USE TO-DAY.

CUMMER line of
CRATES, for every service,
CANNOT be excelled.

RIGID, collapsible or folding
RIGHT in all proportions
REASONABLE in price.

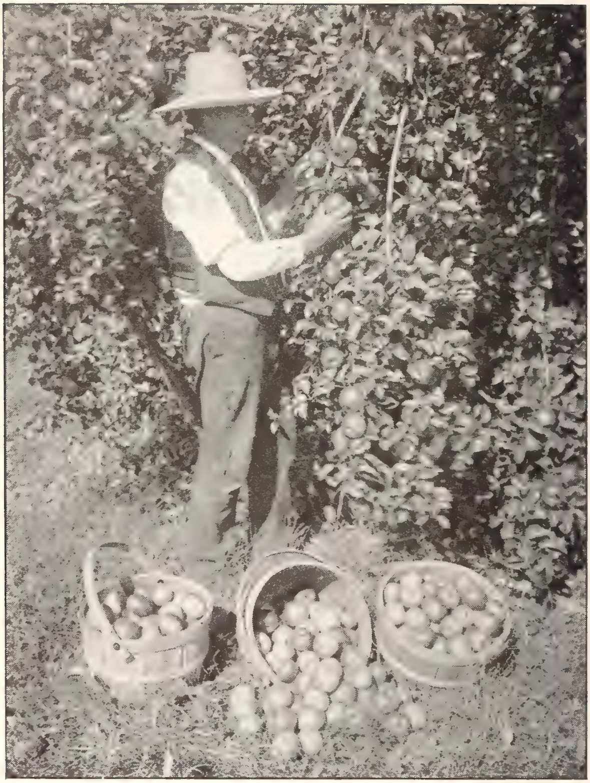
ALL materials used
ARE carefully selected and construction
ASSUREDLY honest throughout.

TAKE our word for it
THIS brief statement is worthy
TO fill your "pipe of reflection."

EACH crate is as nearly
EVERLASTING as is humanly possible and
ENCOMIUM encourages examination.

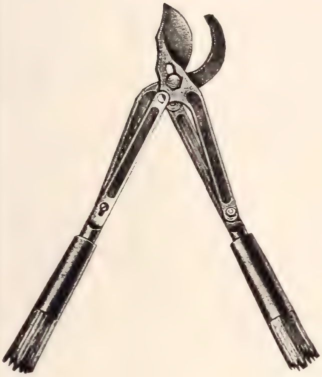
STRONG language is never
SERVICEABLE unless backed up by the goods
SEND for catalog and price list.

CUMMER M'F'G. CO.,
Cadillac, Mich., or Flora Dale, Pa., Box 45-T



Picking Adams County York Imperial.
Nothing But Fancy Fruit in Sight.

Adams County Grows Fine Fruit.



4 Good Business Propositions

Any one or more of which can be obtained on a very small investment.

No. 1 Upper left ORCHARD KING Pruner with its double acting compound lever cuts a two inch limb easily.

No. 2 Upper right KANSAS Improved automatic in action, no hand levers to bother, its quick and cuts a limb 1¼ inches.

No 3 Lower left HAPPY THOUGHT a fast one for setting back, budding, etc. Capacity ¾ inch limb.

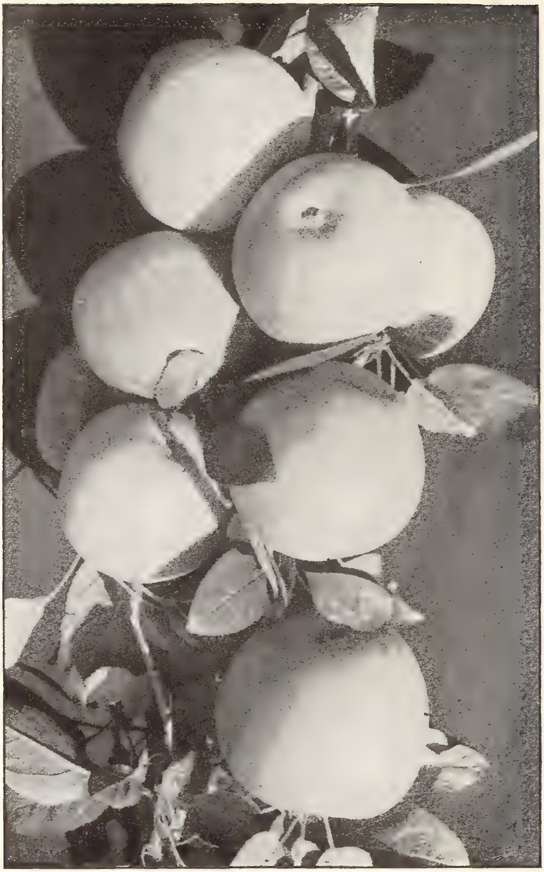
No. 4 The DETROIT, another with a pump gun speed and an inch limb capacity.

Don't overlook these high quality knives, but for your own best interest ask for our illustrated circulars and prices. Just mail a card NOW to

International Tool Company

169 Brooklyn Ave.

DETROIT, MICHIGAN



A CLUSTER OF ADAMS COUNTY GROWN "WINTER BANANA," (every specimen perfect).

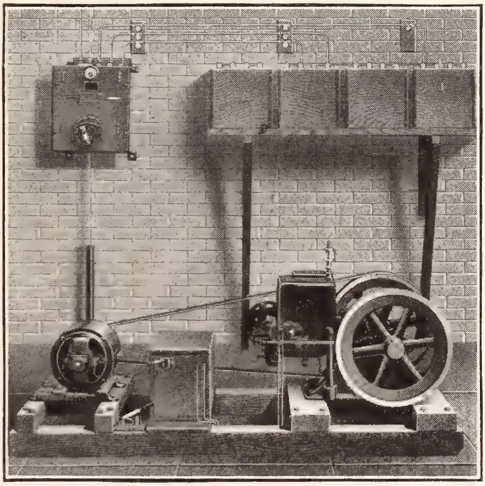
WE GROW LUSCIOUS STRAWBERRIES, ALSO.

ELECTRICITY IN YOUR HOME -:-

Save Money, Time and Labor

PRACTICAL

ECONOMICAL



DEAN HOMELITE PLANT

will not only *light every* room in your *home* and *outbuildings*, but it will operate your *feed cutter, washing machine, food chopper, sewing machine, grindstone, cream separator, ventilating fans,* or, in fact ANYTHING that uses electricity for power.

¶ You can easily set up the Dean "HOMELITE" Plant.

¶ Installing instructions furnished with each Plant, are so complete that a mere novice can install it.

¶ The engine and dynamo comes to you mounted on one skid; the storage batteries and power board complete the equipment.

¶ Starts by simply throwing in a switch—no cranking.

¶ So simple that a child can operate it.

¶ By the use of storage batteries we arrange so that you charge them for a certain period during the day and then they supply the light at night—without running the engine—an ideal system.

THE DEAN ELECTRIC COMPANY

1053 Taylor Street **ELYRIA, OHIO**

"Look for Dean Where Quality's Seen"

A Well Tilled Orchard.

CRESTMONT EDGEWOOD

J. G. STOVER

Bendersville, Pa.

Apples Peaches Potatoes

BOTH PHONES

CLEARBROOK, ARDEN and PROSPECT ORCHARDS

OVER 500 ACRES IN ORCHARD

Trees! Trees! Trees!

Among the 100,000 apple trees we have to offer for Spring of 1913 are

20,000 Stayman's Winesap
5,000 Grimes' Golden
5,000 Jonathan, all 2 years, 4½--6 feet

Also other varieties in lots not quite so large. We can also offer a large lot of one year apples---all leading varieties

¶ The peach orchard proposition is now booming. Money to be made in this line. Have us quote you stock. Can offer 75,000 to 90,000 fine peach trees at this date.

The Mountain View Nursery Co.

WILLIAMSPORT, MARYLAND

Everything in Nursery Stock

Adams County York Imperials—"None Better Grown."

CHESTNUT BLIGHT.

AT

"The Home of Fine Clothes"

You will find gift suggestions for
all, from baby to grandparents

When in town make our place your headquarters

To all A Merry Christmas

Funkhouser & Sachs

"The Home of Fine Clothes"

GETTYSBURG, PA.

The Christmas Store

Ready---Everything ready. The Gift things have all been here for several days

HANDKERCHIEFS—The Great Christmas article. Never so many as now. Ladies', Gentlemen's and Childrens. A beautiful line of them—1c. to $1.00 each. Japanese hand-marked linens, all sizes. Other linens of all kinds.

GLOVES, FURS, BLANKETS, RUGS, HOSIERY

A beautiful line of Ladies' Neckwear for Christmas. Gent's Neckwear. *Special prices* given on Ladies' Coats for *Holidays.*

See our line of Christmas Fancy Novelties before purchasing elsewhere

DOUGHERTY & HARTLEY, GETTYSBURG

Skinner System of Irrigation With Celery.

Modern Methods Mean Money to You

Time Was When Any Old Thing Would Do

Any old field for an orchard (often too steep or too rocky or too poor for anything else)

Any old trees, of any old variety, set any old way

Any old cultural methods (or none) coupled with any old care (if any)

Any old ladder, plus any old saw (or ax) equaled any old pruning (or butchering)

Any old spray material, applied at any old time with any old sprayer

Any old grading (or none) packed in any old barrel or box. Result (of necessity)

ANY OLD PRICE

IT WON'T DO IN THE TWENTIETH CENTURY

Only by using modern methods can you hope to

GET YOUR SHARE

Poor equipment is worse than foolish. It means loss every time

Use sharp pruning tools of approved type (WE HAVE THEM)

Cultivate with Cutaway and Forkner Light Draft Harrows (ASK US FOR CATALOGS)

Use the best ladders you can buy (NONE BETTER THAN TILLEY'S)

Select spray materials with care, *lack of it spells loss* (PRATT AND BOWKER BRANDS HAVE PROVED GOOD, we are sole agents for Pennsylvania)

Apply them with best apparatus available (AIR TIGHT SPRAYERS, *power*, GOULD AND E. C. BROWN *hand and knapsack* ARE THE CREAM *catalogs for the asking*

Carefully picked and graded fruit packed in neat, clean boxes or barrels will always command good prices. We supply orchard crates, Oregon boxes, standard New York barrels, barrel presses and all paper requisites needed in packing fancy fruit

Write us for any Orchard Requisite. If we cannot supply it we can probably tell you where to get it

SPECIAL PRICES TO MEMBERS F. G. A.

ASK US ABOUT IT

EDWIN C. TYSON, **FLORA DALE, Pennsylvania : :**

WHOLESALE AND RETAIL

ORCHARD TOOLS AND SUPPLIES

ADAMS COUNTY FRUIT RECORDS

Shipments Over Gettysburg & Harrisburg R. R.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gettysburg, ... (G. & H. R. R.)	1905	318	333	651	4	1	.....	.....	.....
	1906	28	.....	28	....	....	.....	.....	.....
	1907	127	.....	127	1	....	$2 25	.....	.....
	1909	12	.....	12	....	....	.....	.....	.....
	1910	50	.....	50	....	....	.....	.....	.....
	1911	41	.....	41	....	....	.....	.....	.....
	1912	123	.....	123	....	....	.....	.....	.....
Biglerville, ...	1903	8813	987	9800	65	....	.....	.....	.....
	1905	7932	.....	7932	53	2	.....	.....	.....
	1906	2785	165	2950	20	....	1 00	$0 70	.....
	1907	17164	4216	21380	142	12	2 20	1 50	$0 50
	1908	4956	.....	4956	33	6	1 40	75	65
	1909	10785	137	10922	73	1	2 50	1 50	55
	1910	20017	1500	21517	144	10	2 00	.....	.....
	1911	37897	552	38449	256	....	2 00	.....	.....
	1912	26521	779	27300	182	19	1 50	80	45
Guernsey, ...	1903	2870	2413	5283	35	....	.....	.....	.....
	1905	1771	1166	2937	20	11	.....	.....	.....
	1906	1414	1329	2743	18	2	.....	.....	.....
	1907	4798	2760	7858	52	15	2 35	1 50	55
	1908	2173	.....	2173	15	7	1 50	.....	65
	1909	7320	.....	7320	49	5	2 50	.....	55
	1910	11659	1267	12926	86	12	2 00	.....	.....
	1911	13600	363	13963	93	....	2 00	.....	.....
	1912	4713	574	5287	35	3	1 50	80	45
Bendersville, ...	1903	4163	.....	4163	28	....	.....	.....	.....
	1905	4000	2351	6351	42	16	.....	.....	.....
	1906	1109	1561	2670	18	20	.....	.....	.....
	1907	2824	6268	9092	61	22	2 25	1 50	50
	1908	2264	.....	2264	15	21	1 40	.....	65
	1909	3531	1200	4731	32	15	2 50	1 50	50
	1910	5628	2132	7760	52	30	2 00	.....	.....
	1911	8894	366	9260	62	7	2 00	.....	.....
	1912	4251	946	5197	35	30	1 50	80	50

Biglerville—1910, 1 car cherries; 4 cars cider syrup; 43 cars canned apples; 5 cars evaporated apples; 1911, 3 cars cider syrup; 100 cars canned apples; 8 cars evaporated apples; 1912, 1 car pears; 42 cars canned apples.

Guernsey—1910, 7 cars peaches; 1911, 210 pkgs. pears; 240 pkgs. plums; 650 pkgs. cherries; 1912, 350 pkgs. peaches; 120 bushels pears.

Bendersville—1908, 2 cars pears; 1910, 1 car pears; 4 cars peaches; 1911, 1,009 baskets peaches; 3 cars pears; 1912, 2,880 baskets peaches; 1 car pears; 3 cars evaporated apples.

Save Your Fruit From Damage.

THE widespread increase of the codling moth and other insects injurious to fruit trees causes an annual loss to growers of seven million dollars a year. The surest way for you to prevent your fruit from being wormy or badly damaged is to carry out a regular plan of spraying with some reliable material.

SHERWIN-WILLIAMS
NEW PROCESS ARSENATE OF LEAD

is a general insecticide for all leaf-eating insects. It is superior to many other brands on the market, because it contains the arsenic in exactly the right proportion and the proper chemical combination, thus insuring a material that will not injure or scorch the foliage but is sure death to insects feeding on the leaves. It is extremely miscible in water and will combine readily with Lime-Sulfur and Bordeaux Mixture. Light in gravity, it remains well in suspension so that a uniformly poisonous spray can be thrown from the finest nozzle. For prices and further information on this product, come in and see us.

694

"PARASITES LIVE ON THE PROFITS"

Save your fruit and crops from damage with

Sherwin-Williams High Quality Insecticides

S-W New Process Arsenate of Lead (Paste)
S-W New Process Arsenate of Lead (Powdered)
S-W Lime Sulfur Solution
S-W Paris Green
S-W Bordeaux Mixture
S-W Pruning Componnd
S-W Carbolinol (Vermicide)

Send for our Hand-book, "Spraying a Profitable Investment"

THE SHERWIN-WILLIAMS CO.

PHILADELPHIA, PA.
Manufacturers of High Quality
Insecticides and Fungicides
NEWARK, N. J.

Adams County Fruit Records

Shipments Over Gettysburg & Harrisburg R. R.—(*Continued*)

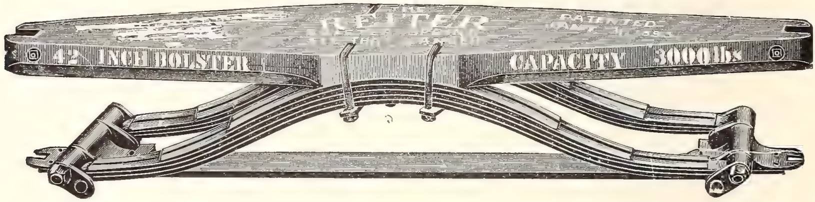
	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Gardners,	1903	997	985	1982	13	....	.....	.....	.....
	1905	912	5215	6127	41	4	.....	.....	.....
	1906	.....	.....	.....	....	....	.....	.....	.....
	1907	6905	5440	12345	82	4	$1 75	$1 50	$0 50
	1908	433	.....	433	3	1	.....	.....	.....
	1909	2275	4571	6846	46	....	.....	1 35	.....
	1910	1566	3722	5288	35	1	.....	.....	.....
	1911	3900	4800	8700	58	....	2 00	.....	.....
	1912	1860	.....	1860	12	6	1 50	.....	45
Starners,	1905	682	1016	1698	11	5	.....	.....	.....
	1906	664	133	797	5	4	.....	.....	.....
	1907	1572	219	1791	12	3	.....	.....	.....
	1908	487	.....	487	3	3	1 50	.....	65
	1909	1825	8	1833	12	4	2 50	.....	55
	1910	2500	2192	4692	31	3	2 00	.....	.....
	1911	2018	668	2686	18	2	2 00	.....	.....
	1912	2000	563	2563	17	18	1 50	.....	45
Hunters Run,	1903	625	.....	625	4	....	.....	.....	.....
(Good year)	1905	160	160	320	2	8	.....	.....	.....
	1906	295	262	557	4	5	1 50	75	50
	1907	1417	514	1931	13	12	1 75	85	50
	1908	1704	.....	1704	11	1	1 50	.....	.....
	1909	1289	510	1799	12	1	2 50	.....	.....
	1910	2103	2190	4293	29	1	.....	.....	.....
	1911	3750	300	4050	27	....	2 00	.....	.....
	1912	2040	.....	2040	14	....	.....	.....	.....
G. & H. R. R.,	1903	17468	4385	21853	146	....	.....	.....	.....
Total	1905	15617	9908	25525	170	47	.....	.....	.....
	1906	6295	3450	9745	65	35	.....	.....	.....
	1907	34797	19217	54014	360	56	.....	.....	.....
	1908	12017	.....	12017	80	39	1 45	75	65
	1909	27037	6426	33463	223	26	2 50	1 50	55
	1910	43523	13003	56526	377	57	2 00	.....	50
	1911	70100	7049	77149	514	9	2 00	.....	.....
	1912	41508	2862	44370	296	76	1 50	80	45

Gardners—1906, 2 cars pears; 1907, 1 car pears; 1908, 2 cars pears; 1910, 2 cars pears; 4 cars peaches; 1911, 5 cars pears; 25 cars canned apples.

Starners—1910, 2 cars peaches; 1911, 300 bushels pears; 200 baskets peaches; 1912, 500 baskets peaches; 300 bushels pears.

THE "REITER"

BOLSTER SPRING



☝ See That Hanger ☝

The best bolster spring made. Complete and ready for use as sold. Warranted and guaranteed in every way. These springs are just what **FARMERS, GARDNERS, FRUIT GROWERS, PEDDLERS, DAIRYMAN, and TEAMSTERS want,** as they will make their rough wagons ride as easy as any Spring Wagon, thus saving them the cost of Spring Wagons and enabling them to deliver Fruits, Vegetables, Eggs, etc., unbruised and unbroken from hauling and in as good condition as when they left home.

With these Springs, wagons will pull easier and last longer, harness wear longer and horses work easier.

These Springs don't work on top of the Bolster, like other Bolster Springs, but on each side in shackles, on the same principle as any high priced Spring Wagon. These Springs can't be broken by overloading or rebounding like a Spring Wagon.

By overloading, the springs will work down on each side of the Bolster and the wagon will become rough again. In fast driving over rough roads the springs, not being attached to the bed or bolster, can't be broken by rebounding or lifting up of the bed.

WITH

The Reiter Bolster Spring

ON THE

American Farm Wagon

you can haul or carry any and everything equal to any spring wagon and at one-half the cost.

No one using a rough wagon should be without The Reiter Bolster Spring, as they will save the cost the first year. Remember they are warranted and guaranteed in every way. Made to carry from 1,000 to 10,000 pounds. Measure your wagon between standards and order a set; give them a fair trial and let your neighbors, friends and the dealer you got them from know what you think of them.

W. C. REITER, Sole Maker

Price on Application. WAYNESBORO, PA.

Adams County Fruit Records—(*Continued*)

Shipments Over Western Maryland R. R.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Orrtanna, ...	1903	3300	.....	3300	22	....	.....	.....	.....
	1905	1062	.....	1062	7	....	.....	.....	.....
	1906	3659	.....	3659	24	....	.....	.....	.....
	1907	3177	2342	5519	37	1	$2 00	$1 50	$0 50
	1908	2686	1020	3706	25	....	.....	.....	.....
	1909	741	840	1581	10	....	2 40	1 50	.....
	1910	8216	4045	12261	82	½	.....	.....	.....
	1911	7043	3846	10889	73	....	2 00	.....	.....
	1912	8912	2798	11710	78	1	1 50	60	.....
McKnightstown, ...	1903	3438	.....	3438	23	....	.....	.....	.....
	1905	7895	178	8073	54	1	.....	.....	.....
	1906	2296	254	2550	17	1-6	1 00	1 00	47
	1907	3393	1155	4548	30	3	2 15	1 85	50
	1908	1785	251	2036	13	....	1 75	.....	.....
	1909	7724	2030	9754	65	1-3	2 50	1 50	.....
	1910	14275	1800	16075	107	2	.....	.....	.....
	1911	26297	2231	28528	190	¼	2 00	.....	.....
	1912	4122	520	4642	31	2	1 50	60	.....
New Oxford, ...	1907	.....	1033	1033	7	....	.....	.....	.....
	1908	.....	.....	.....	....	....	.....	.....	.....
	1909	.....	276	276	2	....	.....	.....	.....
	1910	.....	695	695	4¾	....	.....	.....	.....
	1911	390	.....	390	2½	....	.....	.....	.....
	1912	275	152	427	3	....	.....	.....	.....
East Berlin, ...	1905	50	.....	50	....	....	.....	.....	.....
	1906	1140	1193	2333	15	1-3	$1 80	$0 90	$0 70
	1907	49	.....	49	....	½	2 25	2 25	60
	1908	.....	.....	.....	....	....	.....	.....	.....
	1909	10	205	215	2	....	.....	.....	.....
	1910	1	1	2	....	....	.....	.....	.....
	1911	18	160	178	1	....	.....	.....	.....
	1912	.....	80	80	½	....	.....	.....	.....
W. M. R. R., ... Total	1903	6738	.....	6738	45	....	.....	.....	.....
	1905	10380	1320	11700	78	5	.....	.....	.....
	1906	7447	1447	8894	59	3	.....	.....	.....
	1907	7720	13948	21668	144	7	.....	.....	.....
	1908	4536	2891	7427	49	1	1 75	.....	.....
	1909	8873	4870	13743	91	1-3	2 50	1 50	.....
	1910	22946	7135	30081	201	2½	.....	.....	.....
	1911	33959	6637	40596	270	1¼	2 00	.....	.....
	1912	14091	3550	17641	117	3	1 50	60	.....

Littlestown—1910, 3 cars apples; 2 cars potatoes; 1911, 2 cars apples; 1912, 5 cars potatoes.

Dillsburg—1910, 2 cars apples; 1911, 2 cars apples.

McKnightstown—1911, 1 car pears; 1912, 40 bushels pears.

Orrtanna—1911, 620 baskets peaches; 1912, 1,810 baskets peaches.

Charmian—1911, 48 barrels apples; 1912, 40 barrels apples; 50 bushels pears.

Gettysburg—1912, 42 barrels apples; one-third car potatoes.

Virginia Mills—1912, 300 barrels apples; 4 cars potatoes.

Granite Station—1912, 400 barrels apples.

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Adams County Fruit Records—(*Continued*)

Total Fruit Marketed in County.

	Year	No. Bbls. shipped In bbls.	No. Bbls. shipped In bulk	No. Bbls. Total	No. Cars Apples (150 Bbls. to Car)	No. Cars Potatoes (500 bus. to Car)	Av. Price Paid Per Bbl.	Av. Price Paid Per Bbl. for Bulk	Av. Price Paid Per Bus. Potatoes
Total shipped,	1903	24206	4385	28591	191	....	.....	.....	.....
	1905	25997	11228	37225	248	52	.....	.....	.....
	1906	13742	4897	18639	124	38	.....	.....	.....
	1907	42517	33165	75682	504	63	.....	.....	.....
	1908	16553	2891	19444	129	40	$1 50	$0 75	$0 60
	1909	35910	11296	47206	314	27	2 50	1 50	50
	1910	67219	20138	87557	583	61½	2 00	1 20	50
	1911	104659	13686	118345	789	10	2 00	75	1 00
	1912	55599	6412	62011	413	84	.....	.....	.....
Evaporated,	1903	......	6547	6547	44	....	.....	.....	.....
	1905	......	10670	10670	71	....	.....	.....	.....
	1907	......	8333	8333	56	....	.....	.....	.....
	1908	......	.....	......	....	....	.....	.....	.....
	1909	......	4666	4666	31	....	.....	.....	.....
	1910	......	8600	8600	57	....	.....	.....	.....
	1911	......	21750	21750	145	....	.....	.....	.....
	1912	......	5000	5000	33	....	.....	.....	.....
Canned,	1905	......	2400	2400	16	....	.....	.....	.....
	1907	......	10000	10000	67	....	.....	.....	.....
	1908	......	1673	1673	11	....	.....	.....	.....
	1909	......	12398	12398	82	....	.....	.....	.....
	1910	......	16700	16700	111	....	.....	.....	.....
	1911	......	25000	25000	167	....	.....	.....	.....
	1912	......	27108	27108	181	....	.....	.....	.....
Cider,	1907	......	9524	9524	63	....	.....	.....	.....
	1908	......	6670	6670	44	....	.....	.....	.....
	1909	......	5714	5714	38	....	.....	.....	.....
	1910	......	11120	11120	74	....	.....	.....	.....
	1911	......	12500	12500	83	....	.....	.....	.....
	1912	......	8000	8000	53	....	.....	.....	.....
Total fruit,	1903	24206	10932	35138	234	....	.....	.....	.....
	1905	25997	24298	50295	335	52	.....	.....	.....
	1906	13742	4897	18639	124	38	.....	.....	.....
	1907	42517	61022	103539	690	63	2 25	1 75	55
	1908	16553	11234	27787	185	40	1 50	75	60
	1909	35910	34074	69984	465	27	2 50	1 50	50
	1910	67219	56558	123777	825	61½	2 00	1 20	50
	1911	104659	72936	177595	1184	10	2 00	75	1 00
	1912	55599	46520	102119	680	84	1 50	80	50

Comparison of Percentages

Year	Per Cent. barreled	Per Cent. sold bulk	Per Cent. evaporated	Per Cent. canned	Per Cent. cider	Per Cent. total fruit compared to 1903
1903	70	12	18	..	..	100%
1905	52	22	26	..	..	143%
1907	41	32	8	10	9	295%
1909	51	16	7	18	8	200%
1910	54	16	7	14	9	356%
1911	59	8	12	14	7	500%
1912	54	6	5	27	8	344%

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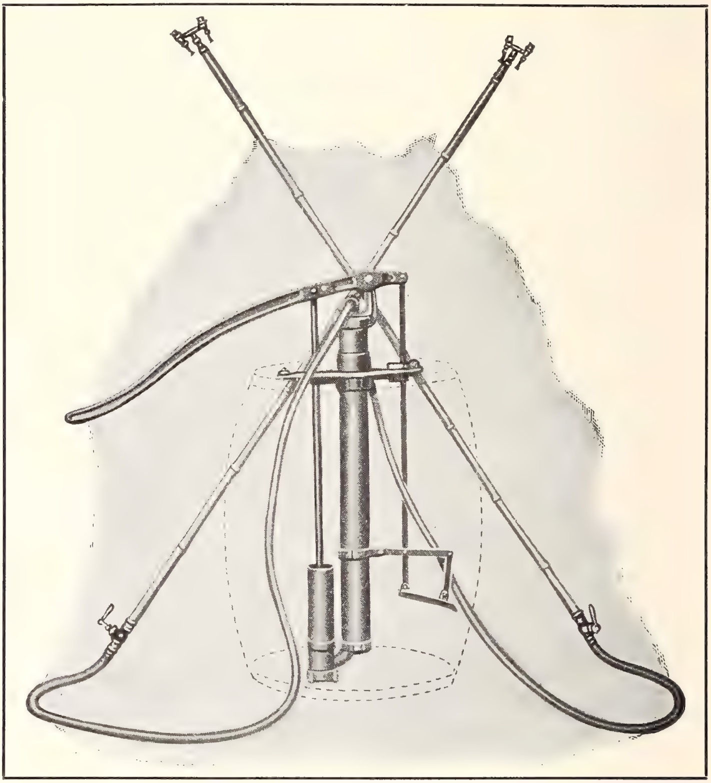

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INDEX.

A

- Addresses—
  - “Peaches,” 25–32
  - “Essentials in Spraying,” 33–35
  - “Duties of Citizenship,” 36–45
  - “Winter Injuries to Fruit Trees,” 46–55
  - “The Use of Fertilization in Apple Orchards,” 57–75
  - “Peach Packing and Packages,” 77–83
  - “Grape Growing and Its Possibilities on a General Fruit Farm,” 85–90
  - “The Chestnut Blight,” 91–98
  - “Cover Crops and Their Effect on the Soil,” 95–106
  - “Some Problems Confronting the Apple Grower of To-day,” 107–110
  - “Alfalfa,” 111–116
  - “Lessons from Western Apple Growers,” 117–120
  - “Principles of Cookery as Applied to Farm Cooking,” 121–126
- Apple Varieties, 107
- Amendments, 19
- Adams, W. S. (Adv.), 56
- American Agricultural Chemical Co. (Adv.), 76
- Air Tight Steel Tank Co. (Adv.), 22–23

- Advertisers—
  - Bowker Insecticide Co. (Spray Materials), 2
  - J. G. Harrison & Sons (Nursery Stock), 4
  - The Deming Co. (Sprayers), 6
  - Deyo-Macey Engine Co. (Sprayers), 8
  - G. P. Read (Packages and Cushions), 10
  - B. G. Pratt Co. (Spray Materials), 12
  - York Chemical Works (Fertilizers), 14
  - Goulds Manufacturing Co. (Sprayers), 16
  - Musselman Canning Co. (Greeting), 18
  - T. H. Evans & Co. (Commission Merchants), 20
  - Air Tight Steel Tank Co. (Power Sprayers), 22–23
  - Keystone National Powder Co. (Dynamite), 24
  - T. S. Hubbard Co. (Grape Vines and Small Fruits), 32
  - U. S. Kleinfelter (Barrels), 55
  - First National Bank, Gettysburg, 56
  - Hill Top Orchards Warehouse Co., 56
  - P. S. Orner, (Barrels), 75
  - American Agricultural Chemical Co. (Fertilizers), 76
  - Franklin Davis Nursery Co., 83
  - Wickersham Nurseries, 84
  - Battlefield Nurseries, 98
  - Chas. Cooper & Co. (Sulphur), 106
  - Cutaway Harrow Company, 120
  - Madison Cooper Co. (Cold Storage Plants), 126
  - Baugh & Sons Company (Fertilizers), 127
  - J. W. Richley Auto Co. (Automobiles), 128–129
  - Citizens Trust Co., 130
  - Kelley Brothers (Nursery Stock), 131
  - Gettysburg National Bank, 132
  - Cummer Mfg. Co. (Crates), 133

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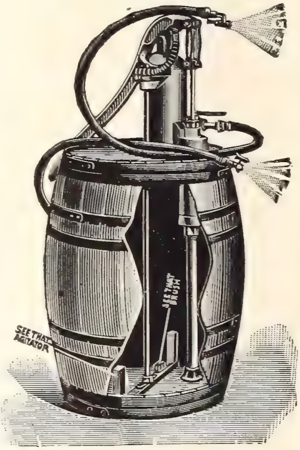

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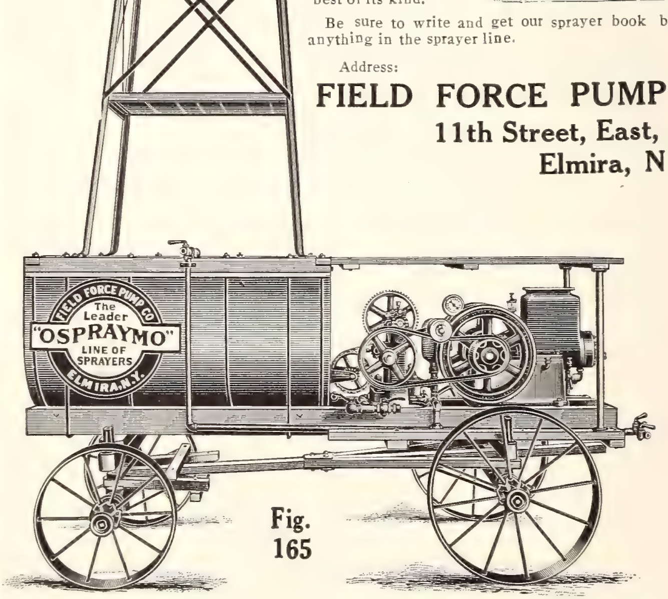

Fig. 165

GEO. E. HOFFMAN,
Agent.
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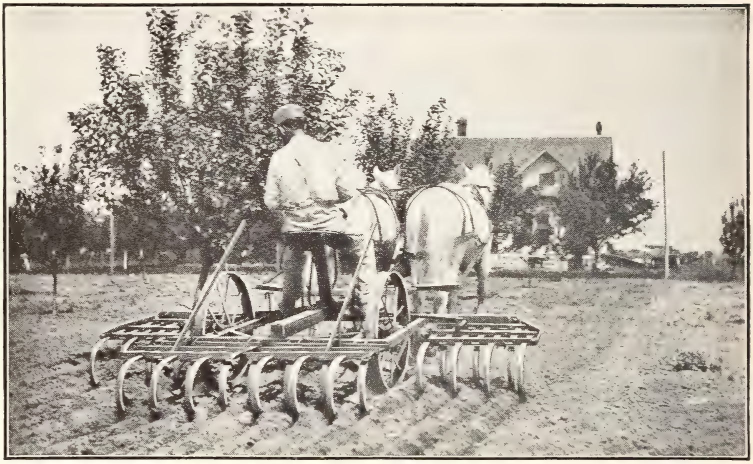
  International Tool Co. (Pruning Tools), 135
  The Dean Electric Company (Electric Manufacturing Plants), 137
  J. G. Stover (Orchards), 138
  The Mountain View Nursery Co., 139
  Funkhouser & Sachs (Tailors), 140
  Dougherty & Hartley (Merchants), 141
  Edwin C. Tyson (Orchard Tools and Supplies), 142
  Sherwin-Williams Company (Spray Materials), 144
  W. C. Reiter (Bolster Springs), 146
  DuPont Powder Co. (Dynamite), 148
  Morril & Morley Mfg. Co. (Sprayers), 150
  Field Force Pump Co. (Sprayers), 152
  Light Draft Harrow Co. (Orchard Harrow), 154
  John S. Tilley (Ladders), 156
Adams County Fruit Records, Gettysburg and Harrisburg R. R. Shipments, 143–145
  Western Maryland R. R. Shipments, 147
  Total Shipments and Total Fruit, 149
Adams County Orchard Photographs, 134–136–139
Advantages of Tower in Spraying, 34
  Of Agitator in Spraying, 34
Alfalfa, 111–116
  Illustrations, 112–114
  As Cover Crop, 74, 104

B

Baugh & Sons Company (Adv.), 127
Bowker Insecticide Co. (Adv.), 2
Battlefield Nurseries (Adv.), 98
Baskets, 78
Bassets, C. E., 29, 52, 54, 33-35, 73, 117-120
Black, W. H., 90, 97
Bolster Springs (Adv.), 146
Banks (Adv.), 56, 130, 132
Barrels (Adv.), 55, 75
  Cushions, Caps and Circles for (Adv.), 10
Blake, Prof. M. A., 46–55, 77–83
Barnyard Manure on Peaches, 31
By Laws, 19–21
Broiling Steak, 125

C

Committees, List of, 19
  Duties of, 19–21
Cultivating Machinery (Adv.), 120, 154
Constitution, 17
Chestnut Blight, 91–98, 140
Crates (Adv.), 133
Crown Gall on Peach, 29
Citizens Trust Co. (Adv.), 130
Chas. Cooper & Co. (Adv.), 106
Compressed Air Sprayer (Adv.), 22, 23
Crop Reports, 143, 145, 147, 149
Commercial Lime Sulphur, 2, 144
Cummer Mfg. Co. (Adv.), 133
Cutaway Harrow Co. (Adv.), 120
Cooking, 121–126
Cover Crops, 30, 99–106, 74
Collingwood, H. W., 36–45



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D

Dean Electric Co. (Adv.), 137
DuPont Powder Co. (Adv.), 148
Deyo-Macey Engine Co. (Adv.), 8
Deming Company, (Adv.), 6
Davis, Franklin & Co. (Adv.), 83
Dues, 17
Duties of Officers, 19–21
Discussion Following Addresses of—
    Prof. F. N. Fagan, 29
    Prof. M. A. Blake, 52, 83
    Dr. J. P. Stewart, 73
    Mr. Lloyd S. Tenney, 90
    Mr. Keller E. Rockey, 97
    Dr. J. S. Lipman, 105, 116
    Mrs. Edith C. Salisbury, 124
"Duties of Citizenship," 36

E

Executive Committee, List of, 3
    Duties of, 21
Eldon, Robert M., 30, 52, 55
Experimental Orchards, Report on, 57–75
Essentials in Spraying, 33–35
Evans, T. H. & Co. (Adv.), 20
Effect of Adding Plant Food to Orchards, 59
Effect of Cover Crops on the Soil, 99–106

F

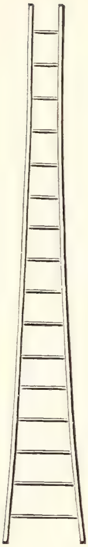
First National Bank, Gettysburg, (Adv.), 56
Field Force Pump Co. (Adv), 152
Food Required by Mature Orchards, 57–58
Farm Credits, 42
Food Values, 121
Freezing of Trees, 46-55
Fireless Cooker, 120
Fruit, Adams County Records, 143, 145, 147, 149
    of Adams Co., at Pittsburg Show, (illustrations), 24, 35, 158
Fertilizers, 14, 76, 127
    For Orchards, 57–75
    Experiment in Adams Co., 64–65
    Experiment in Bedford Co., 61
    Experiment in Lawrence Co., 60
    Recommendations, 69–70
    Time and Method of Application, 71
Funkhouser & Sachs (Adv.), 140

G

Gould Mfg. Co. (Adv.), 16
Grove, W. E., 31, 74
Gettysburg Nat. Bank (Adv.), 132
Gettysburg and Harrisburg R. R. fruit shipments, 143–145
Grape Growing, 85–90
Griest, A. W., 53, 116
Georgia Carriers, 79, 80

H

Honest Packing, 43, 117, 120, 131
Harrison, J. G. & Sons (Adv.), 4
Harvesting Peaches, Method of, 81
Horticultural Requisites, 142



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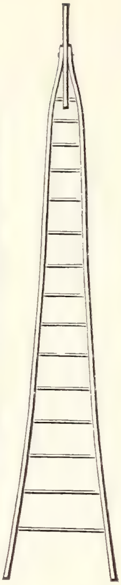

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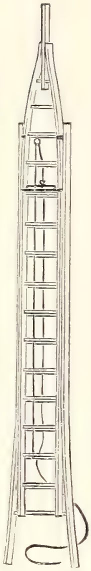

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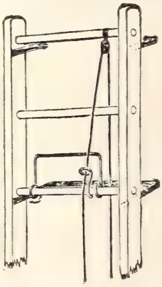

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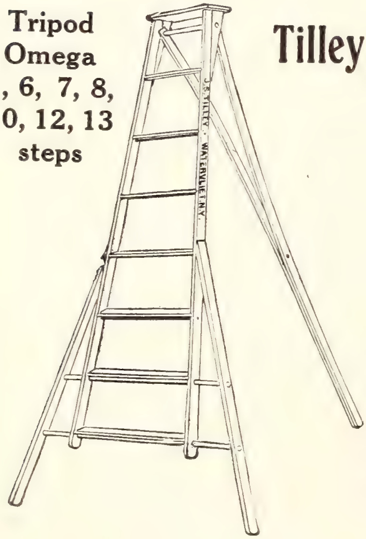

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I

Illustrations—
  Sprayers (Adv.), 6, 8, 16, 22, 23, 150, 152
  Harrows (Adv.), 154
  Bolster Springs (Adv.), 146
  Ladders (Adv.), 156
  Spray Materials (Adv.), 144
  Crates (Adv.), 133
  Electrical Apparatus (Adv.), 137
  Pruning Tools (Adv.), 135
  Picking Adams County York Imperial, 134
  Well Tilled Orchard, 138
  State College Greenhouses, 132-133
  Automobiles (Adv.), 129
  Effect of Fertilizers on Orchards, 60
  Baskets of Peaches, 78, 78a
  Crates of Peaches, 80, 80a
  Advantage of Thinning Peaches, 80a
  Plate of Apples, 134
  Cluster of Adams Co. Winter Banana, 136
  Chestnut Blight, 92, 96, 140
  Basket of Adams Co. York Imperials, 139
  Dish of Strawberries, 136
  Alfalfa, 112, 114
  Crimson Clover, 102
  Good Place for Cull Apples, 130
  Neat Honest Packing, 131
  Skinner System of Irrigation, 141
  Adams County Blue Ribbon Fruit at Pittsburg Show, 24, 35, 158
  International Tool Co. (Adv.), 135

K

Keystone Powder Co. (Adv.), 24
Kelly Brothers (Adv.), 131
Kinds of Food, 122

L

Lipman, Dr. Jacob P., 99–106, 111–116
Lime Sulphur, Method of Making, 33, 83
Little Peach, 29
Light Draft Harrow (Adv.), 154
Lessons from Western Apple Growers, 117, 120

M

Membership, Roll of, 5, 7, 9, 11, 13
  Constitutional Requirement for, 17
Manure vs. Nothing on Apples (Illus.), 60
Manure vs. Fertilizer, 66
Marketing, 77, 82
Musselman Canning Co. (Adv.), 18
Madison Cooper Co. (Adv.), 126
Morrill & Morley Mfg. Co. (Adv.), 150
Mountain View Nursery Co. (Adv.), 139
Making Good Coffee, 124

O

Officers, List of, 3
  Consist of, 17
  Duties of, 18, 21
Object of Association, 17
Order of Business, 21
Orchard Heaters, 32

Orchard Fertilizer Test Outlined, 72
Orner, P. S. (Adv.), 75

P

Permanent Effect of Fertilizers, 63
Parcel Post, 42
Pratt, B. G. Co. (Adv.), 12
Pure Food, 43
Pruning Peach, 27, 28
Peach Culture, 25, 32
Plant Food Result of Adding to Orchards, 59
Planting Peach, Method of, 27
Peach Fillers in Apple Orchards, 32
Peach Packing and Packages, 77, 83
Problems Confronting Apple Growers, 107, 110
Principles of Cooking, 121, 126

R

Reiter, W. C. (Adv.), 146
Read, G. P. (Adv.), 10
Rockey, Keller E., 91–98
Richley, J. W. Auto Co. (Adv.), 128, 129
Reviving Frozen Trees, 53

S

Sherwin-Williams Co. (Adv.), 144
Sulphur (Adv.), 106
Salisbury, Mrs. Edith C., 121, 126
Stewart, Dr. J. P., 52, 57–75
Soy Beans as Cover Crop, 104
Storage of Trees, 32, 52, 54

T

Tower for Spraying, Importance of, 34
Tilley, John S. (Adv.), 156
Tables—
  I. Relative Plant Food Draft of Wheat and Apples, 58
  II. Influence of Fertilizers on Yield. (Lawrence Co.), 60
  III. Influence of Fertilizers on Yield. (Bedford Co.), 62
  IV. Influence of Fertilizers on Yield. (Adams Co.), 65
  V. Influence of Fertilizers Elements on Apples, 66
  VI. General Fertilizer for Apple Orchards, 70
  VII. Plan of Local Orchard-Fertilizer Test, 72
Trees, Winter Injury to, 46, 55
Tenny, Lloyd S., 85, 90, 98, 107-110, 116
Tyson, C. J., 53, 74, 103, 105

V

Varieties, of Apples, 107
Vetch as a Cover Crop, 104

W

William, J. L., 98
Western Maryland R. R., Shipments Over, 147
Well Tilled Orchard, 138
Winter Injury to Fruit Trees, 46, 55
Wickersham, R. A., 29, 30, 53, 74, 116

Y

York Chemical Co. (Adv.), 14
York Imperial, Illustration of, 134, 130, 158
Yellows of Peach, 29, 30
Yield Influenced by Fertilizers, 62, 65

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